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The Automobile

Car Registrations Gain 71,884 in 3 Months

New York, California, Illinois, Ohio and Pennsylvania Lead

By Donald McLeod Lay

ONE of the most significant indications that the automobile business in the United States is increasing and prospering is the fact that registrations of automobiles and motor trucks up to October 1 totaled 1,229,530, allowing for a duplicate registration of 25,441. This represents an increase of 71,884 cars and trucks for the months of July, August and September, or over 23,961 a month. Of this number 1,125,257 are passenger cars of the gasoline type, while the electric passenger cars number 34,075. According to the most accurate figures obtainable there are 89,605 commercial vehicles in use in this country, comprising 69,418 gasoline machines, 17,687 electrics, 2,500 steam passenger cars and some 250 steam trucks.

In most respects there is a substantial gain over the figures for each class secured by THE AUTOMOBILE in its census for the year 1913 up to July 1. Gasoline passenger cars have increased 72,901 and gasoline commercials 2,053. The figures for the electrics are somewhat lower than at the time of the July census, this being due to the fact that very few of the registration officials are systematic enough to segregate the various classes of vehicles and the estimates furnished by the various local authorities were slightly lower than at the previous time. In securing the information for this article THE AUTOMOBILE requested the registration officials to give, wherever possible, the number of non-residents registered in the state and also the number of registrations made owing to transfer of ownership of cars. The number of non-residents registered in the United States, according to their figures up to October 1, was 7,153, while the number of re-registrations was 18,288, making the total amount of duplicate registrations 25,441.

Practically everyone, whether actively interested in the automobile industry or not, is curious regarding the number of cars in the country and in various sections. For several years there has been a more or less close contest, for the honor of having most registrations, between New York, California, Illinois, Ohio and Pennsylvania, the five states which have consistently led the country in this respect since registrations were first made. A glance at the chart at the bottom of page 1090 will reveal the progress in this struggle for the last three years. In 1911 New York led with 84,989 as its total registration, California being second with 59,202, Ohio third with 45,739, Pennsylvania fourth with 44,182 and Illinois fifth

REGISTRATION IN EACH STATE

New York	121,793	South Carolina	10,500
California	118,135	Maine	9,557
Illinois	90,522	North Carolina	9,300
Ohio	79,427	Virginia	8,797
Pennsylvania	73,924	Rhode Island	8,784
Iowa	68,120	Florida	8,754
Michigan	53,301	Oklahoma	8,100
Massachusetts	52,034	Louisiana	7,000
New Jersey	50,333	Kentucky	6,847
Indiana	45,000	Montana	5,490
Minnesota	43,700	Vermont	5,472
Texas	36,500	Alabama	5,300
Wisconsin	35,931	New Hampshire	4,947
Missouri	34,901	West Virginia	4,925
Kansas	32,980	Arkansas	3,609
Washington	22,720	Mississippi	3,100
Georgia	22,382	Arizona	3,000
Connecticut	21,829	Idaho	2,200
Dist. of Columbia	14,116	Delaware	2,169
South Dakota	14,080	Wyoming	1,550
Maryland	13,526	Utah	1,418
Colorado	13,000	Nevada	1,064
North Dakota	12,925	New Mexico	765
Tennessee	12,200		
Oregon	11,801		
Nebraska	11,702	Total	1,229,530

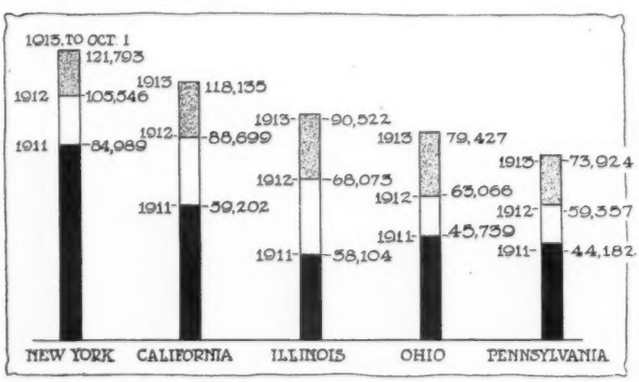
In the above tabulation all duplicate registrations of automobiles and trucks have been considered, so that the figures given should represent the total motor vehicle registration in every state in the union with the greatest possible accuracy. Note the wide range of difference between New York with its 121,793, and New Mexico with its 765

Distribution of Dealers, Garages, Repair Shops, etc.

State	Dealers	Garages	Supplies	Repairs	Total
Alabama	96	62	2	10	154
Arizona	49	34	2	4	66
Arkansas	62	54	1	7	90
California	920	748	46	74	1347
Colorado	161	193	5	10	205
Connecticut	282	274	10	39	427
Delaware	37	31	0	7	49
Dist. of Columbia	64	42	5	9	102
Florida	130	126	3	8	182
Georgia	182	154	5	12	277
Idaho	57	40	1	.....	67
Illinois	1031	812	36	65	1423
Indiana	401	389	9	31	611
Iowa	945	625	8	23	1050
Kansas	512	327	6	13	612
Kentucky	129	89	2	4	154
Louisiana	76	47	1	6	92
Maine	152	134	3	5	206
Maryland	142	106	6	7	179
Massachusetts	659	595	44	71	1,029
Michigan	474	378	20	26	644
Minnesota	612	342	14	14	722
Mississippi	33	46	.....	5	75
Missouri	539	269	26	59	695
Montana	110	71	1	4	133
Nebraska	404	299	7	10	549
Nevada	38	21	.....	1	49
New Hampshire	127	100	1	9	168
New Jersey	496	604	20	36	830
New Mexico	32	33	.....	.....	44
New York	1,373	1,332	120	124	2,254
North Carolina	135	99	1	12	162
North Dakota	244	129	1	12	293
Ohio	903	592	34	48	1,047
Oklahoma	132	99	2	4	175
Oregon	149	121	11	9	206
Pennsylvania	852	841	41	63	1,291
Rhode Island	78	81	6	21	145
South Carolina	90	70	5	4	121
South Dakota	217	146	.....	7	255
Tennessee	122	71	5	4	146
Texas	361	196	12	19	448
Utah	40	28	2	7	54
Vermont	72	75	1	8	112
Virginia	135	97	3	11	172
Washington	195	129	10	17	250
West Virginia	96	55	2	1	106
Wisconsin	429	349	7	30	545
Wyoming	32	27	.....	2	41
West Indies	1	1	.....	1	2
Canada	391	322	13	10	472
Mexico	12	12	.....	1	13
Hawaii	4	4	.....	1	5
Total	15,126	11,951	560	982	20,594

with 38,104. In the following year, New York and California were still in the lead with 105,546 and 88,699 respectively. Illinois, however, had jumped from fifth place to third with 68,073, Ohio dropping to fourth place with 63,066 and Pennsylvania becoming fifth with 59,357. During 1913 California has continued increasing its registration at a remarkable rate, and by October 1 was beginning to push New York for first place, the Empire State having a lead of only 3,658. The other states have also altered somewhat in their relative registrations, Illinois having gained 11,095 over Ohio and the Buckeye State showing a lead of 5,499 over Pennsylvania. From all indications, if California continues to buy cars and trucks at its present rate, it will not be long before the never-questioned leadership of New York will fall before its onslaught.

It is estimated that the number of cars and trucks produced for the 1913 season will reach a total of approximately 450,000.



Total registration in the five leading states for the past 3 years

Distribution of Automobile, Truck and Motor Manufacturers

State	Automobiles	Commercial Vehicles	Motors	Total
Alabama	1	1	.....	1
California	8	10	.....	16
Colorado	1	4	.....	4
Connecticut	4	4	2	8
Georgia	1	1	.....	2
Illinois	17	29	10	49
Indiana	36	15	7	52
Iowa	4	5	1	9
Kentucky	1	3	.....	4
Maine	.....	1	.....	1
Maryland	4	4	.....	5
Massachusetts	11	9	2	19
Michigan	48	40	13	89
Minnesota	2	10	1	12
Missouri	5	10	.....	13
Nebraska	2	3	.....	4
New Jersey	6	16	1	21
New York	19	47	13	72
North Carolina	1	1	.....	1
Ohio	31	45	10	71
Oklahoma	.....	1	.....	1
Oregon	1	1	.....	2
Pennsylvania	14	28	5	40
Rhode Island	.....	2	1	3
South Dakota	1	1	.....	1
Tennessee	3	2	.....	3
Texas	2	2	.....	2
Virginia	1	1	.....	1
West Virginia	1	3	.....	4
Wisconsin	10	19	9	32
Canada	19	10	2	27
Total	254	328	77	569

It is very difficult to secure accurate figures on production, owing to the fact that the fiscal years of the various companies do not coincide and that at other periods of the year their records are not complete. Of the estimated production of 450,000 cars and commercial vehicles, the bulk are gasoline passenger cars, a rough estimate placing the figure at 410,000 while the motor truck industry has attained such proportions that an output of 30,000 vehicles is by no means improbable. Somewhat less than 1,000 steam cars, both passenger and commercial, together with several thousand electric machines go to make up the total. The production for the entire year of 1912 was 378,261 motor vehicles, comprising 340,746 gasoline passenger cars, 27,909 gasoline commercial vehicles, including 200 fire department machines, 8,813 electric passenger cars, 743 electric trucks and 850 steam passenger cars. The large proportions of the 1913 output may be more readily realized by comparison with the figures of 1911, when the total production of 209,957 machines included: 194,565 gasoline passenger cars; 8,500 gasoline trucks, 105 fire wagons, 5,634 electric passenger cars, 553 electric trucks and 600 steam passenger vehicles.

Many people are interested in the tendency toward lower prices for automobiles. The average price for 1912 was slightly below $1,000, this average price being based on the valuation of the total output for the year and the number of machines produced. In 1913 the introduction of many new cars selling at unusually low prices has had an appreciable effect on the average price, though so few of these new cars have been produced that their influence has not yet become as great as will probably be the case at this time next year.

In studying the table of registration on page 1091 it should be borne in mind that in California, the District of Columbia, Florida and Utah owners of automobiles are required to register their machines only once, whereas most of the states require an annual registration accompanied, of course, by the little ceremony of paying an annual license fee. Several of the states have local registration, that is, all cars are registered by town or county officials and not by the state authorities. This is the case in Louisiana, Southt Carolina and Texas. In securing figures for these states, local estimates were necessary.

Many New Laws in Force

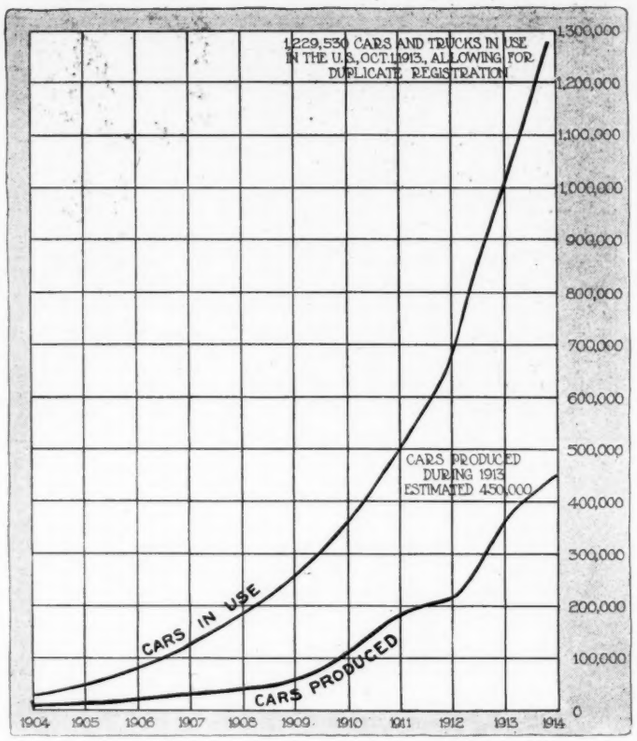
In Colorado the new motor vehicle tax law, the first law requiring an annual state licensing of automobiles in that state, has been in force a little more than three months. Idaho also

has a new law, as have Indiana and Wyoming. The Indiana law is so new that there has not yet been time to register all the cars in the state, this making it appear in the table that there has been a decrease of 16,713 since July 1, 1913. When one realizes the situation it will readily be seen that the figure 45,000 does not represent all the cars and trucks in the state.

Mississippi does not seem to be able to draft a satisfactory automobile law, its first measure of this character, put into effect last spring, having been declared unconstitutional before the last census taken by THE AUTOMOBILE on July 1, and no new law having been adopted. In Ohio, the Warnes Law which was passed this summer to regulate the motor vehicle department of the secretary of state, has been declared unconstitutional, the automobilists of the state having objected to it strenuously. In Washington the secretary of state has had trouble to collect registration fees and has invoked the aid of the police. Only last week it was announced that California automobilists are taking steps to test the motor vehicle law of that state. A general dissatisfaction is being expressed in most of the states with the present legislation covering automobiles and the recent agitation for a Federal regulation is significant.

In compiling the registration table on page 1091, the figures given under the headings, Total Registration, New Registration, Registration to 1913 and Gasoline Passenger Cars in Use, together with those for Non-Resident Registration and Re-Registrations, are those furnished by the registration officials of the various states, excepting in Louisiana. Mississippi and Texas, which at the present time have no provision for the state registration of motor vehicles. The estimates for these states are made on a basis of relative population with reference to location

(*Continued on page 1121.*)

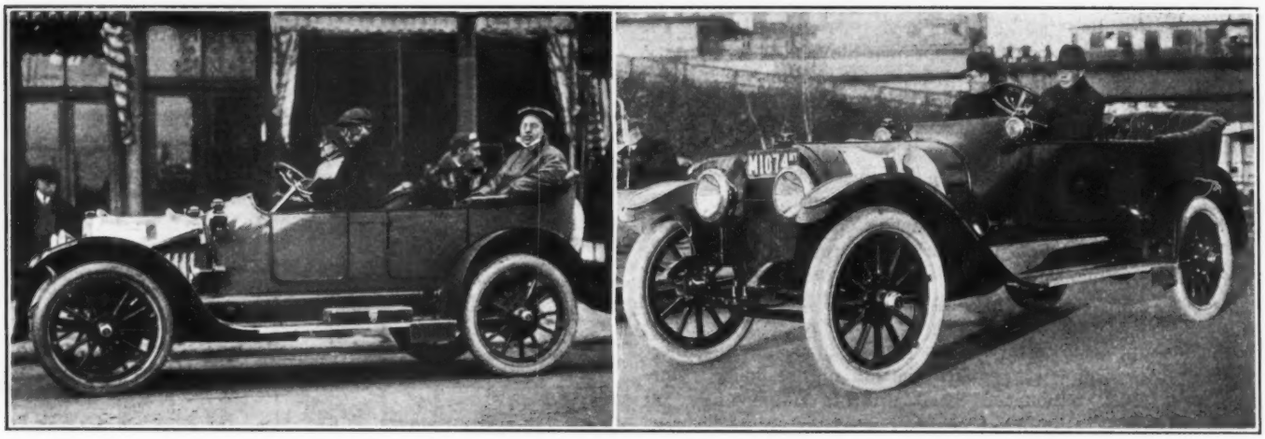


Curve showing car registration and production from 1904

Automobile Registration in Each State in the Union Up to Oct. 1, with Duplicate Registrations.

State or Territory	Total Registration	New Registration	Registration to 1913	Gasoline Passenger Cars in Use	Gasoline Commercial Cars in Use	Electric** Passenger Cars in Use	Elect. ** Commercial Cars in Use	Non-Resident Registration*	Re-Registered ***	Chauffeurs Registered	Remarks
Alabama	5,300	100	5,200	5,115	85	80	20	.....	.....	.....	
Arizona	3,000	1,721	1,109	2,830	65	85	20	.....	.....	638	
Arkansas	3,609	609	3,000	3,484	80	30	15	.....	.....	.....	
California	118,135	6,479	111,656	104,835	9,000	3,500	800	.....	.....	4,846	Perennial registration
Colorado	13,000	3,700	9,300	11,665	300	950	85	.....	.....	1,800	New law
Connecticut	21,829	2,824	19,005	20,359	700	650	120	.....	.....	29,669	
Delaware	2,169	39	2,130	2,004	110	40	15	.....	.....	.....	
Dist. of Columbia	14,116	2,487	11,629	13,176	300	600	40	.....	.....	18,340	Perennial registration
Florida	8,754	386	8,368	1,814	200	400	40	.....	.....	771	Perennial registration
Georgia	22,382	172	22,210	21,377	500	475	30	.....	.....	.....	
Idaho	2,200	.....	.....	2,075	75	50	.....	.....	.....	.....	New law
Illinois	90,522	14,483	76,039	80,422	6,000	3,500	600	.....	.....	.....	
Indiana	45,000	††	61,713	40,000	2,000	2,000	1,000	.....	.....	3,000	New law
Iowa	68,120	12,519	55,601	65,470	1,500	1,000	150	.....	.....	.....	
Kansas	32,980	5,980	27,000	31,480	700	650	150	.....	.....	.....	
Kentucky	6,847	Decrease	8,256	6,387	300	140	20	.....	.....	.....	
Louisiana**	7,000	102	6,898	6,810	90	75	25	.....	.....	.....	Local registration
Maine	10,843	2,103	8,740	10,190	355	10	2	1,000	286	13,180	
Maryland	13,526	1,171	12,355	12,491	850	150	35	.....	.....	4,359	
Massachusetts	59,954	7,486	52,468	57,555	5,342	600	56	920	7,000	19,998	
Michigan	53,301	6,103	47,198	49,976	2,000	1,100	225	.....	.....	.....	
Minnesota	44,000	5,000	39,000	41,500	2,000	400	100	.....	300	5,000	
Mississippi†	3,100	100	3,000	2,995	50	50	5	.....	.....	.....	State law declared void
Missouri	34,901	2,168	32,733	32,451	1,600	700	150	.....	.....	.....	
Montana	5,600	1,841	3,739	5,440	150	10	.....	10	100	250	
Nebraska	11,702	.....	.....	10,500	1,000	150	52	.....	.....	.....	
Nevada	1,064	231	833	1,019	40	5	.....	.....	.....	.....	
New Hampshire	6,589	51	6,538	5,926	600	50	13	1,157	485	2,387	
New Jersey	50,658	12,178	38,480	47,708	2,000	550	400	.....	325	43,734	
New Mexico	805	55	750	795	10	.....	.....	.....	40	.....	
New York	129,441	14,420	115,021	111,941	8,500	6,500	2,500	2,041	5,607	52,933	
North Carolina	9,300	622	8,678	8,920	220	150	10	.....	.....	.....	
North Dakota	13,000	4,253	8,747	12,884	10	6	.....	.....	75	.....	
Ohio	80,452	5,752	74,700	72,152	4,000	3,900	400	1,025	.....	9,600	State law declared void
Oklahoma	8,100	100	8,000	7,885	115	100	.....	.....	.....	.....	
Oregon	11,801	801	11,000	10,791	600	360	50	.....	.....	.....	
Pennsylvania	78,437	8,649	69,788	50,000	15,000	3,000	10,000	1,000	3,513	28,000	
Rhode Island	8,784	2,611	6,173	7,617	600	300	267	.....	.....	.....	
South Carolina†	10,500	500	10,000	10,099	316	79	6	.....	.....	.....	Local registration
South Dakota	14,300	Decrease	15,913	13,995	250	50	5	.....	220	.....	
Tennessee	12,200	2,227	9,973	11,855	240	90	15	.....	.....	.....	
Texas†	36,500	500	36,000	33,980	1,800	650	70	.....	.....	.....	Local registration
Utah	1,418	.....	.....	1,288	25	100	5	.....	.....	.....	Perennial registration
Vermont	5,809	1,000	4,809	5,604	150	50	5	.....	337	.....	
Virginia	8,797	1,191	7,606	8,467	200	100	30	.....	.....	.....	
Washington	22,720	2,720	20,000	21,670	800	200	50	.....	.....	.....	
West Virginia	4,925	.....	.....	4,679	160	80	6	.....	.....	.....	
Wisconsin	35,931	5,931	30,000	33,581	900	350	100	.....	.....	.....	
Wyoming	1,550	.....	.....	.....	30	10	.....	.....	.....	.....	New law
	1,254,971	146,365	1,111,376	1,125,257	71,981	34,075	17,687	7,153	18,288	238,505	

NOTE—2,500 steam passenger cars and 250 steam trucks are included among the gasoline machines. Dots indicate that previous figures are doubtful, discrepancies indicating that the registration officials have made an error in reporting. *The number of cars registered belonging to residents of another state. **Some figures from state registration officials, balance from estimates given by local authorities. ***Cars re-registered, owing to transfer of ownership. †Estima ed on sis of population with reference to location and sectional registration. ††New law makes registration figures low.



The two winners—Left, Buick 1, a four-cylinder touring car; right, Buick 11, one of the new sixes

Two Buicks Win 500-Mile Reliability

Finish with Perfect Scores—Chandler Next with Penalty of but One Point—Cars Given Severe Technical Test—Penalties for Accessories

By J. Edward Schipper

NEW YORK CITY, Dec. 6—Two Buicks tied for first place in the 500-mile New York reliability run which closed here today. Both these cars had perfect scores and both were 1914 models, one a new six, the other a model 25 four.

Second place was taken by a Chandler touring car, which had a penalty of but 1 point for a leaky water connection close to the circulating pump.

Third place was captured by a third Buick, which suffered 2 points for a lost fan belt, 2 points for loose nuts and 1 point for a bad electric connection, giving this car a total penalization of 5 points.

Only one point separated a Hudson entry from third place, the six points against this car being charged up to a burnt-out tail bulb which had to be replaced.

The Oakland six touring car was penalized 14 points, for a seized brake, 1; leaky gas tank, 1; headlight tie rod loose, 2, and battery ignition defective, 10. The De Dion 1909 eight-cylinder, four passenger had a penalty which totaled 20 points; 9 for work on the road, 5 for a misfiring cylinder, 1 for a leaky water pump and 5 for a burned-out bulb. The National touring car had a blowout, faulty hand brake and dash lamp, which netted 21 points. Two small Buick runabouts, the only runabouts in the contest, each suffered penalties on the electrical equipment. One got 30 points and the other 45. These were the only penalties these cars received. The Oldsmobile, which had 580 points registered against it, got 570 of them on the brake test. On this test it took 121 feet to stop the car when traveling at 20 miles an hour. Another 10-point penalty was registered against this car on account of defective battery ignition.

The actual run lasted three days, Wednesday, Thursday and Friday. Each day's start and finish was at the same point in New York City and run over different ground. By the side of the driver sat an observer who noted the performance of the car in which he sat and also recorded any cars that were passed on the road and which seemed to be having any difficulty. The observers were changed daily and no observer at any time rode in the car of the company which appointed him. On the observers' cards a record was also kept of the gasoline and oil consumed. Road penalties were fixed by the records on the observers' cars.

The cars were allowed to take on gasoline at the noon and night controls, and at those times could also put oil in the motor. No other oil than the supply for the motor could be added at noon, but at the night control 45 minutes was allowed to the contestants to turn up his grease cups, put new oil in the gearbox, refill his radiator and add gasoline. Whenever this work was done the observer was required to be with the driver. At no time was the driver allowed to approach the car without the observer.

Although there were but eleven entries in this run it was the most remarkable run in many ways that has ever been held in this country. Not only were the cars penalized for lateness at controls and for motor trouble, but also for defective equipment and for work done on the road. This was the first time that cars have been penalized in a reliability run for the electric starting and lighting difficulties, and also the first time that blowouts have been taken into account in making up the score in a technical test of this nature. Besides these other subjects of penalization were speedometers, horns, springs, tire racks, baggage racks, shock absorbers, bumpers, gas tanks, and in fact every bolt, nut and screw in the car, excepting tops, windshields and tire carriers.

The day before starting the cars were subjected to a rigid technical examination. Every part of the car was scrutinized by engineers, and all noticeable defects were recorded. At the

RESULTS

Car	Penalty	Car	Penalty
Buick 25	0	National Four	21
Buick Six	0	Buick 24	30
Chandler Six	1	Buick 36	45
Buick 25	5	Oldsmobile Six	580
Hudson Six	6		
Oakland Six	14	All cars except De Dion were 1914 models	
De Dion Eight	20		

PENALTIES IN 500-MILE RELIABILITY RUN OF THE MOTOR DEALERS' CONTEST ASSN., NEW YORK

No.	Car	Entrant	Driver	Road	Motor	Dist. Brakes		Points	Clutch	Gearset	Technical	Electric	Speedometer	Total
						Hand	Foot							
1	Buick	Buick Motor Co	E. Woodruff	0	0	37	38	0	0	0	0	0	None	0
11	Buick	Buick Motor Co	W. Smith	0	0	34	29	0	0	0	0	0	0	0
5	Chandler	Brady-Murray Motor Corp.	J. M. Breitenbach	0	0	28	35	0	0	0	1	0	0	1
2	Buick	Buick Motor Co	A. A. Guilford	0	0	33.5	30	0	0	0	4	1	None	5
10	Hudson	A. Elliott Rainey	A. W. Harman	6	0	44.5	46	0	0	0	0	0	0	6
6	Oakland	Sydney Bowman	H. A. Neeley	1	0	28	37	0	0	0	3	10	0	14
8	De Dion	Emanuel Lescaris	E. Cordier	9	5	41.5	32.5	0	0	0	1	5	0	20
9	National	Poertner Motor Car Co	Steve Casey	10	0	58	30	8	0	0	0	3	0	21
3	Buick	Buick Motor Co	C. Jones	0	0	29.5	26.5	0	0	0	0	30	None	30
4	Buick	Buick Motor Co	J. D. Coote	0	0	23.5	24	0	0	0	0	45	None	45
7	Oldsmobile	Oldsmobile Co., N. Y.	T. Speer	0	0	45	121.0	570	0	0	0	10	0	580

WHY POINTS WERE GIVEN

Car 2:
- Lost fan belt 2
- Tail light bracket loose 2
- Faulty electric connection 1
- Total 5

Car 3:
- Burned out bulb 5
- Defective gnition 25
- Total 30

Car 4:
- Two bulbs burned out 10
- Ignition on battery side defective 10
- Starter inoperative 25
- Total 45

Car 5:
- Leaky water pump 1

Car 6:
- Adjusted brake 1
- Leaky tank 1
- Headlight tie rod two nuts loose . 2
- Battery ignition defective 10
- Total 14

Car 7:
- Foot brake test 570
- Battery ignition defective 10
- Total 580

Car 8:
- Dirt in gas line work 9
- Cylinder missing 5
- Leaky water pump 1
- One bulb burned out 5
- Total 20

Car 9:
- Blowout 10
- Hand brake 8
- Dash lamp faulty 3
- Total 21

Car 10:
- Replace tail lamp and work 6

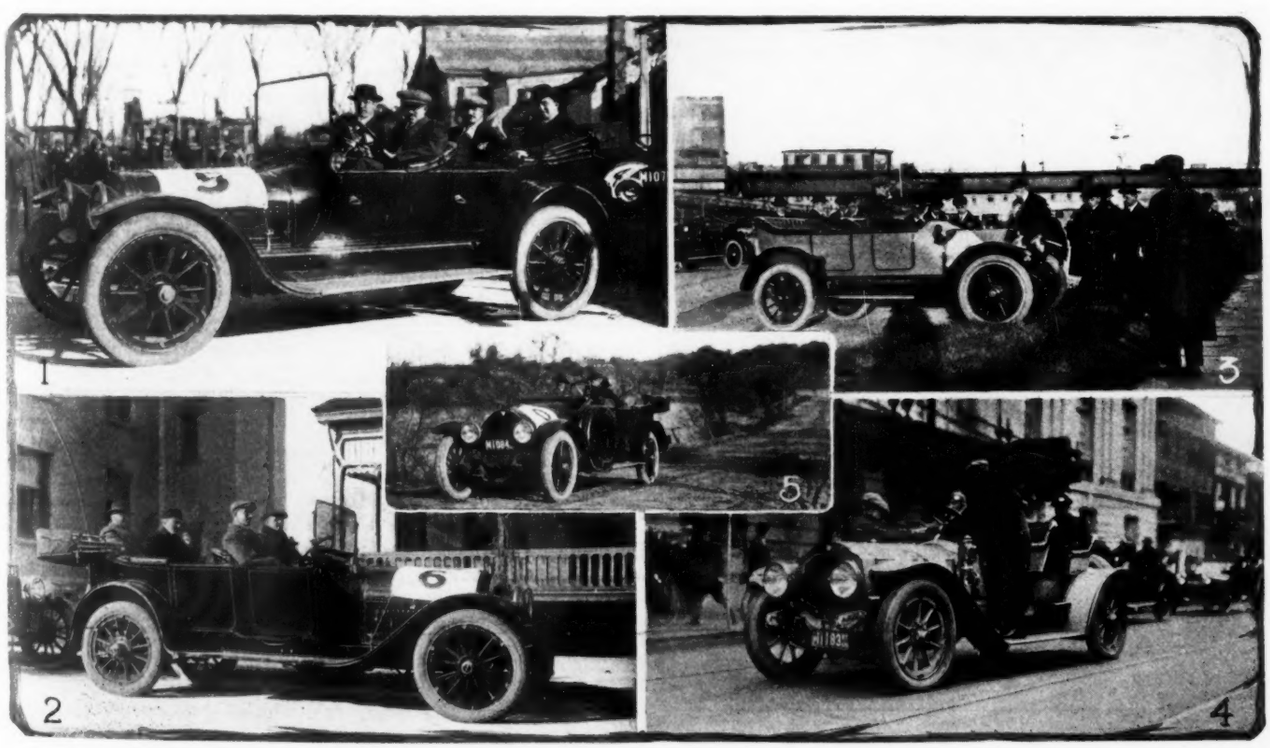
close of the run the cars were again subjected to another detailed inspecton and the results compared. The differences between them were the basis of penalization for technical defects.

After the run the cars were also given a brake test, and a close inspection was made into the performance of the clutch, gearset and motor. In the brake test the cars were required to stop on either set of brakes within a distance of 50 feet at the speed that they were required to average in the contest. As shown in the accompanying table of results, these speeds were 16, 18 and 20 miles per hour. If the car stopped within this distance there was no penalty, but for every foot between 50 and 60, 1 point was given, from 60 to 70, 5 points, and for every foot over 70, 10 points. On this examination two of the entries suffered, an Oldsmobile and a National. The Oldsmobile ran 71 feet over the 50 mark with the foot brake, and was penalized, therefore, 570 points. The National passed the 50 mark by 8 feet on the emergency brake, and was given 8 points.

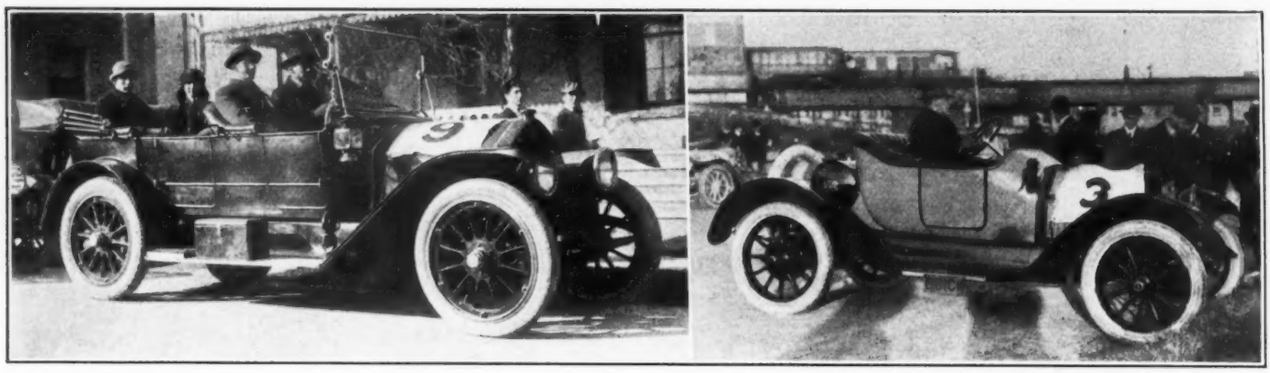
Clutch Gearset and Motor Tests

On the clutch test the cars were brought with the two front tires against a 6-inch curb. The low gear was engaged and the motor speeded. The cars was either required to spin the wheels, stall the motor or climb the curb. There were no failures in this respect.

On the gearset test the cars were required to show a perfect performance on each speed forward and reverse. This test



1—No. 5 Chandler, which finished second. 2—No. 6 Oakland. 3—No. 2 Buick. 4—No. 8 De Dion. 5—No. 10 Hudson



Left, the National No. 9, which had a blowout the third day. Right, Buick 3, which was penalized for ignition

was completed by all cars without any penalties being imposed.

The motor test consisted in determining if there were any perceptible knocks in the motor, and also if the motor was firing regularly on all cylinders. One penalty only resulted from this test. The De Dion entry, a 1909 car carrying an eight-cylinder motor was penalized 5 points for one missing cylinder.

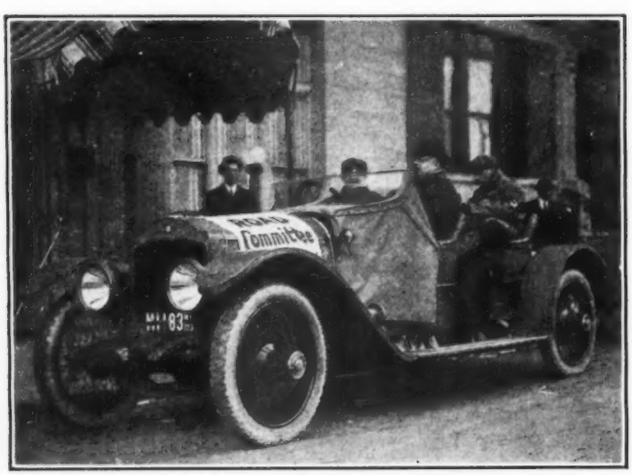
Preliminary Technical Examination

On the day before the run started the cars were garaged and no one was allowed to approach them except the technical committee. When the members of the committee approached the car to be measured a representative of the entrant was required to be present to witness the examination.

The electrical division of the technical committee made a thorough investigation of the ignition, lighting and starting systems. Every car entered had electric lights, and all but two had electric starters. The full lamp load was carried 3 hours per day. The current consumed in starting the motor and in carrying the full lamp load, the speed at which the starter cranked the motor, the voltage drops and the generator output were measured. The technical part of the electric equipment, such as the condition of the generator brushes, wiring, connections and terminals was made the subject of a careful examination. The men engaged on this work were Messrs. Lee C. Carlton, Bosch Magneto Co., Roger B. Whitman, Bosch Magneto Co., and Herbert Chase, Testing Laboratory of the Automobile Club of America.

The remainder of the technical committee devoted its attention to a careful measurement of the distance between fixed points on the two front and rear wheel felloes, the spring openings and the backlash in the steering gear.

In addition the entire car was rigidly inspected for loose nuts and bolts, defective bodies, doors, lamps, brackets, etc.



De Dion car used by the Road Committee in its work

The conditions of the motor manifolds were noted and every grease cup and oiler was observed to see that it was in place before the car started. At the close of the technical inspection the cars were filled with gasoline and oil and the bonnets, radiators, gasoline tanks and spare tires sealed up with wire and lead seals.

On the Road

On the road the cars were divided into three divisions. Cars under 231 cubic inches piston displacement were required to maintain an average speed of 16 miles per hour; cars between 231 and 301 cubic inches a speed of 18 miles per hour, and cars over 301 cubic inches 20 miles an hour. Lateness at noon and night controls was penalized at the rate of 1 point per minute. There were no penalties for being late.

With but two exceptions any work done while upon the road was a subject of penalization. The two exceptions were for repairing a puncture and for fitting and removing anti-skid devices. The spirit of the rules throughout, however, precluded any possibility of double penalization. That is, where the penalty was imposed for the broken part there would be no penalization for the time spent on the work or for arriving late at the control due to this time spent in work.

The total mileage amounted to 515. Of this 174.9 was made on the first day, 178.3 on the second, and 161.8 on the third. On the whole the roads were all that could be desired. More than 90 per cent. of the distance was on good macadam, and of the remaining 10 per cent. not more than 3 per cent. could be called poor.

The First Day's Run

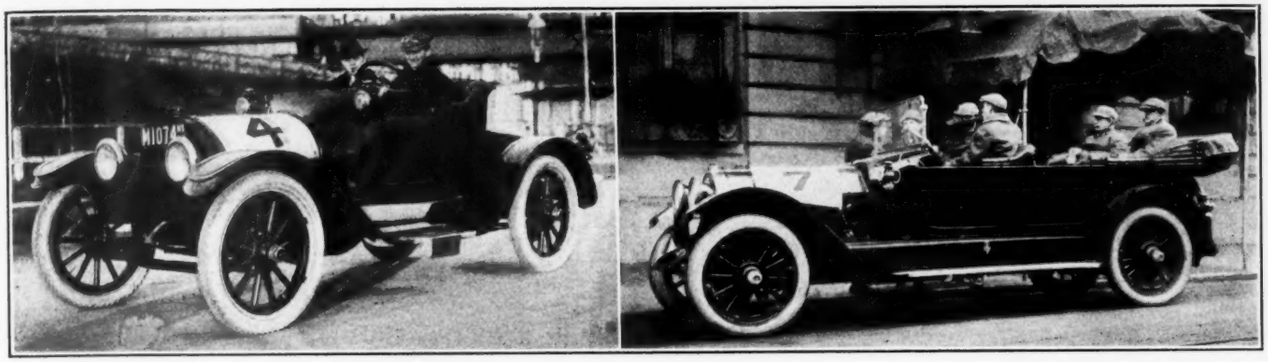
The first day was a circuit over the level roads of Long Island. Beginning a little after 7 o'clock, F. J. Wagner, officiating as starter, put the cars on their way at intervals of 1 minute.

The pace set on this day was a fast one. The noon control was at Riverhead, 83.3 miles. The route was on the north shore, and although this is the hilliest part of the territory none of the grades were steep enough to give any trouble to the smallest cars. What hills there are were encountered a short distance out from New York, and the remainder of the day was spent going through a level country that provided all the species of road that a tourist could desire. The level roads, crisp air and brilliant sunlight offered a combination on this day that compelled speed.

The score for the day showed the De Dion penalized for dirt in the gasoline line which caused the driver to open the bonnet and work on the carbureter three times, the total penalization being 9 points. The Hudson had to replace a lamp bulb which netted 6 points, and the Oakland was charged 1 point because the driver was compelled to hit one brake band with a hammer to release it.

The Second Day's Run

A cloudy, cold and windy day, which threatened to clear at times but never did, gave a rather bleak outlook to the second



Left, Buick 4, which was penalized only for electric troubles. Right, Oldsmobile, which received penalties for brakes

day. The thoughts of the weather vanished though, under the influence of the beautiful rolling country of Connecticut. The noon control was at New Haven. Following the shore of the sound up the Boston Post Road, through the towns of New Rochelle, Greenwich, Stamford, Fairfield and Milford, the tour entered New Haven by the most advantageous route possible. Although slightly steeper than the day before the hills offered no difficulties. It was a severe day on brakes after the cars left New Haven, the roads around Upper Stepney, through which the route looped on the return trip, were poor dirt. Many quick stops were necessary to avoid extreme spring stresses, and through this part of the country the cars did well to keep up their required average speed.

After leaving the dirt roads the cars were once more on the main routes of travel and through Bethel, Danbury, Branchville and Norwalk macadam was again had. From Norwalk to New York the return route was the same as that taken in the morning.

Every car came through the day's run without any penalization. Although many predicted that the roads up through the hilly parts of Connecticut would prove a severe trial for springs none were broken, and the score at the end of the second day stood exactly the same as it did at the end of the first.

Third Day to Poughkeepsie

From New York to Poughkeepsie and back over fine roads, beautiful scenery and excellent weather was the program for the third day. Practically the same roads were taken up to the noon control as down on this route, the only exception being that on the way up the Hudson river was followed closely for the entire distance with the exception of a detour through the country entailed by passing through the towns of Ardsley, Elmsford, Briarcliff, Croton Lake and Yorktown, while on the way down the Hudson river route was followed all the way.

Excellent roads, practically all of which are macadam, were followed and but one severe hill which was taken by practically every car on second speed marked the course for this day. Following the precedent of the first two days neither rain nor snow marred the tour, and no one was late at the controls.

The only tire penalization of the entire tour occurred on this day when the National struck a loose stone and got a blowout penalty of 10 points. This was the only penalization of the day.

The Final Examination

In the final technical examination the damages which had occurred during the 500 miles of travel were discovered. All the measurements which were made on the preliminary test were carefully duplicated and the motor, electric equipment, running gear and accessories examined as before. On this test several penalties were imposed. The severity of the test can be judged from the causes of the penalties which were given on this examination. Many points were due to equipment. The table follows:

No.	Car	Cause	Points	Total Penalty
5.	Chandler	Leaky water pump	1	1
2.	Buick	Lost fan belt	2	
		Two nuts in bracket loose	2	
		Faulty electric connection	1	5
6.	Oakland	Two nuts loose headlight tie rod	2	
		Battery ignition defective	10	
		Leaky gasoline tank	1	13
8.	De Dion	Leaky water pump	1	
		Replaced a bulb	5	6
9.	National	Faulty dash lamp	3	3
3.	Buick	Burned out bulb	5	
		Defective ignition	25	30
4.	Buick	Two bulbs burned out	10	
		Ignition on battery side defective	10	
		Starter inoperative	25	45
7.	Oldsmobile	Battery ignition defective	10	10

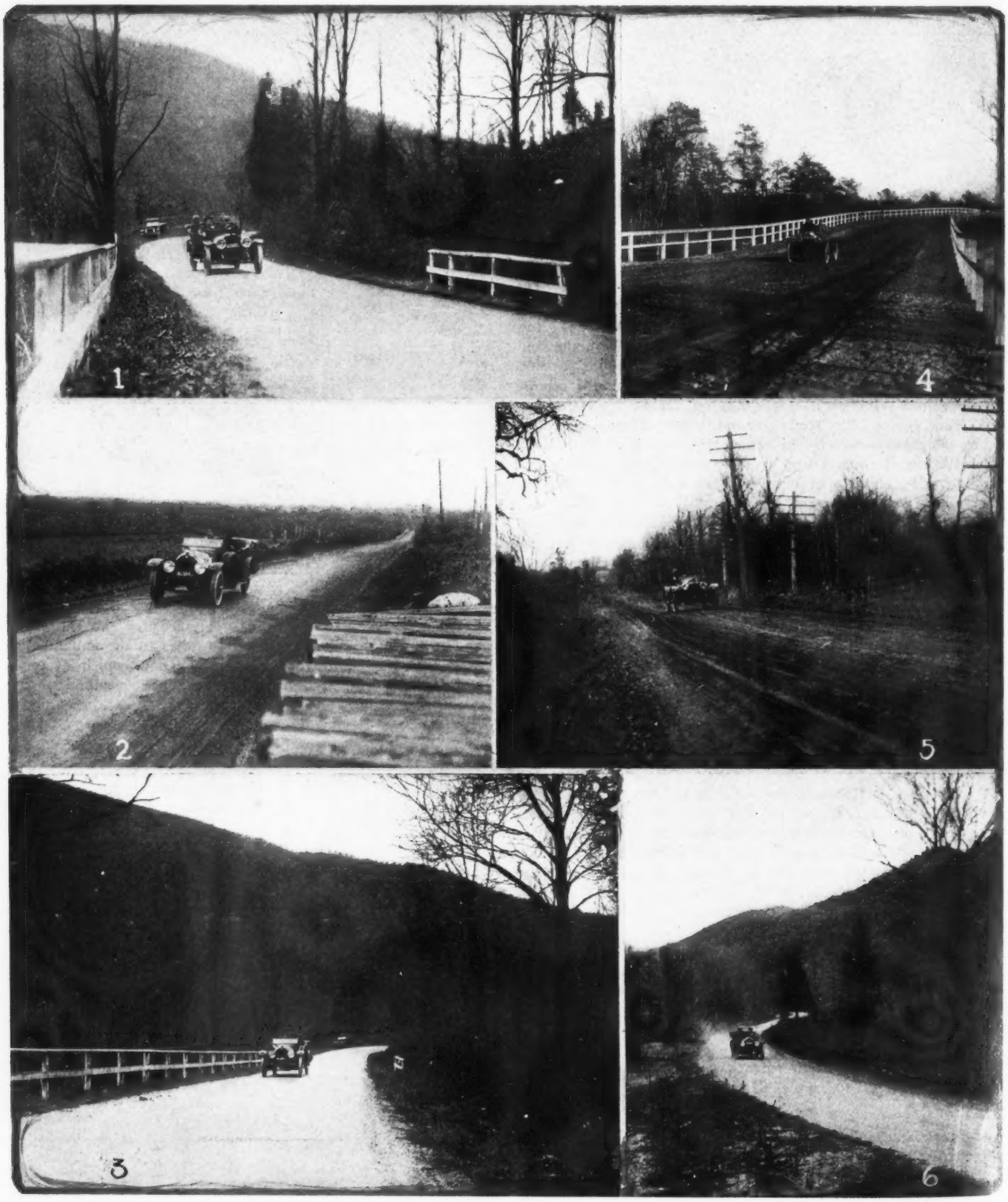
Of great interest is the gasoline consumption. The average of the entire run for all the cars was 12.73 miles per gallon. The highest average for any car obtained for the entire run was Buick No. 3, which averaged 19 miles to the gallon. The lowest was the eight-cylinder 1909 De Dion, which averaged 8.76 miles per gallon. The entire gasoline consumption data for the run is given in the following table:

No.	Car	Passengers	Weight with Passengers, Pounds	Miles per Gallon	Ton-Miles
1.	Buick	4	3,020	15.84	23.92
2.	Buick	4	3,080	16.88	26.00
3.	Buick	2	2,680	19.00	25.55
4.	Buick	2	3,280	16.31	26.74
5.	Chandler	4	3,810	13.90	26.41
6.	Oakland	4	4,350	8.80	19.1
7.	Oldsmobile	4	5,230	9.11	23.79
8.	De Dion	4	5,100	8.76	22.33
9.	National	4	4,900	11.07	27.13
10.	Hudson	4	4,970	9.58	23.76
11.	Buick 6	4	4,658	10.84	25.91
	Average ton-miles per gallon				24.42
	Average miles per gallon				12.73

(*Continued on page* 1121.)

Hudson 10 undergoing the brake test the day after the run

Scenes Along the Route of the New York Reliability Run



1—Chandler car, just out of Poughkeepsie, in the background, is one of the Road Committee cars. This was on the last day of the run in the foothills of the Berkshires

2—Hudson car, shortly after leaving the noon control on the second day at New Haven, Conn. This part of the country is level, but a short distance further on the cars encountered the worst roads of the trip

3—A picturesque bend in the road between Poughkeepsie and New York City. The cars had a fine new state road to travel through this part of the run

4—This is typical of the level roads over which the first part of the run was held. The car shown is on the return trip from Riverhead, L. I., and is on the outskirts of Babylon

5—The quiet beauty of the country around Derby, Connecticut, cannot be described. This is one of the main highways through this part of the state

6—The rolling country and valley roads of that part of New York state which makes up the foothills of the Berkshires furnish an ideal setting for a successful tour, and in the crisp, bracing air of December the enjoyment of the contestants was keen

Which Passed Over Good Roads in Beautiful Country

7—The official De Dion car was ever on the go, carrying the members of the Road Committee. It is shown here passing over the small bridge at Sayville, L. I.

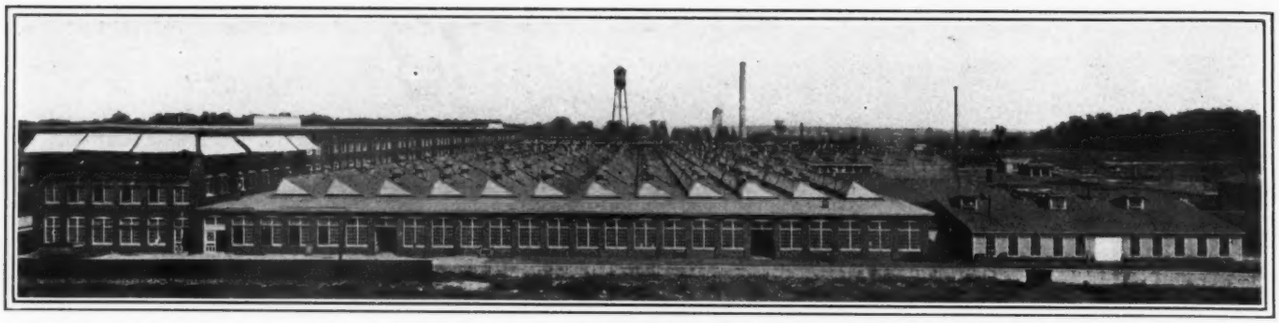
8—One of the enjoyable features on the run were the quiet villages passed through on the first day. These little Long Island towns are scattered along both shores. This shows the Oakland passing through Islip

9—The noon control on the first day's run was at the county jail at Riverhead, L. I. The cars were parked as shown

10—Oftentimes the cars would remain in groups for miles at a time. Here are shown three which were held up at one time at a railroad crossing near Fishkill Landing on the last day

11—Some of the roads on Long Island are sandy. This shows one of the sand roads in good condition. The car shown here is nearing Riverhead, the noon control of the first day

12—De Dion climbing the curb on the clutch test. In this test the cars were brought against a 6-inch curb and required to either climb the curb, spin the wheels or stall the motor



The Maxwell Motor Co.'s factory at Newcastle, Ind., in which parts for 244 different models of cars made by companies inherited by the present Maxwell company are carried in stock and from which shipments are made the day the order is received. The entire factory is given over to manufacturing parts for these 244 models as well as carrying them in stock

Maxwell Uses One Factory for Spare Parts for 244 Models

Spare Parts for All Models of All Companies Inherited by Present Company Manufactured and Carried in Stock—A Factory for Service Only

THE service department of the Maxwell Motor Co., Newcastle, Ind., today stands ready to furnish replacement parts to 122,000 owners of 244 models of automobiles. When the Maxwell company purchased the assets of the old United States Motor Co. from the receiver through the United States courts it inherited eleven automobile factories, each of which had produced a number of models of motor cars during its term of existence. There were 129 Columbia models, fifty-six Stoddard-Dayton, forty-eight Maxwell-Briscoe, three Everitt and a miscellaneous lot of other models formerly made by now defunct concerns under the name of Sampson, Courier, Brush, etc. Each day this service department ships more than 500 orders for such repair parts to all parts of the country.

One who has not visited the mammoth Maxwell plant at Newcastle can have no conception of the Herculean task which confronted the re-organized Maxwell company when it decided to do what no other concern has ever done—concentrate all of the drawings, jigs, tools, dies and repair parts of all of these 244 models so as to furnish that great army of owners with replacement parts as long as their cars are in service.

There was no legal obligation to do this, nor according to the precedents of the trade was there any moral obligation, for the common practice for concerns when succeeding other bankrupt concerns, has been to dispose of the repair-parts business to one of the companies which makes a business of buying up jigs and patterns so as to furnish these owners independently. But the Maxwell company decided that there was a moral obligation even though there was no connection between the present Maxwell company and any of the defunct companies whose assets it inherited.

Gathering From the Four Winds

And so, when it was decided to continue furnishing these replacement parts just as if the cars had been made by the present Maxwell company, the management cast about for a plan for doing it. Walter E. Flanders and his associates decided that there was only one way—to concentrate the entire parts business at one plant. That this plan was the only feasible one will readily be appreciated when it is stated that it would call for more capital than any company in the business possesses to carry a set of parts for all of the 244 models at all points where the Maxwell company has representation.

There might be a bevel drive pinion for Model 32-Q Maxwell at San Antonio, but the nearest ring gear to match that pinion might be in Salt Lake City or Boston. And it proved during the first few weeks of the new company's régime that when that part was shipped on to Chicago, where it was needed, it was not the pinion for the Model 32-Q Maxwell at all, but for the Model B Stoddard-Dayton or the 35 Sampson.

Dallas might have on hand forty-five right rear fenders for a 1908 K-C Stoddard-Dayton, but there were no left rear fenders or any right front ones for that same model in stock there. There might be a whole room full of fenders, but the man who wanted one for his 129th model Columbia would still have to send to some other branch for that fender. And

One view of the large machine shop in this factory, which shop is given over entirely to the manufacture of spare parts for the 244 models

if you needed a new piston for your particular Courier, Boston was probably the nearest point where it could be found.

In a word, it would require millions of dollars to carry all the parts for all the models at all distributing points. To even attempt to do so would break any concern. Besides, nobody knew where all those parts were. Inventories were made, but an inventory does not always indicate, and a description on paper does not always tell just what the part is.

Newcastle Center of Population

There was still another factor to contend with—and a mighty puzzling one it was, too. During the receivership and days of reorganization, the various men who knew these parts had scattered. Some were dead, some had gone abroad. Nobody knew what the parts were or where they were. The only thing to do was to collect them at one point; sort and index them; make up stock sheets and shortage sheets and then manufacture parts to balance. And as the plant at Newcastle is ideally equipped for the purpose and ideally located—within 150 miles of the center of population of the United States—it was decided to make it service headquarters.

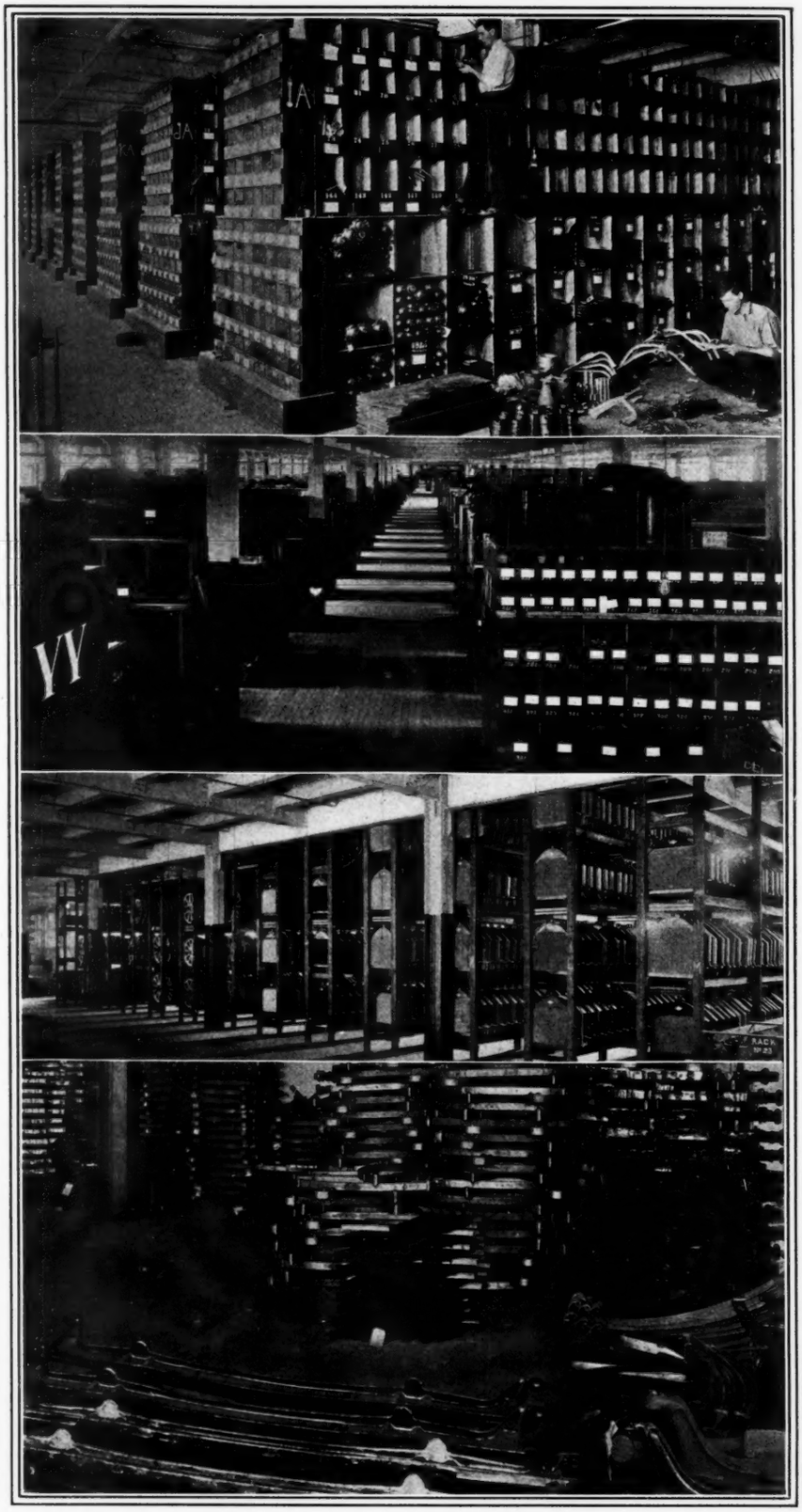
The next thing to do was to concentrate all the special machinery, patterns, dies, jigs and tools in this plant. This was done, and here the Maxwell company now operates a great factory devoted entirely to the manufacture of repair parts for former models, and entirely separate from the manufacture of the present product.

Besides the manufacturing part of the Newcastle plant, there is the actual parts storage building with a total floorspace of 130,000 square feet. It is a building 60 feet wide and 722 feet long and three stories in height, devoted exclusively to this replacement stock.

Bringing Together the Lost Bones

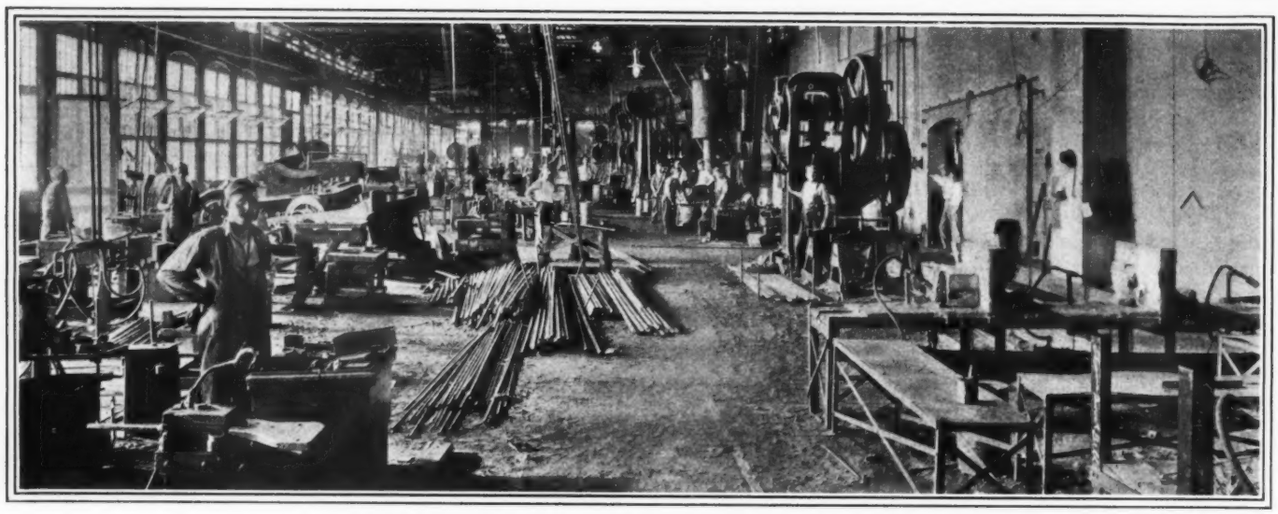
Some idea of the mammoth task which confronted the company after it had surmounted the first work of getting all the machinery and equipment in place may be gained from the fact that it was now necessary to bring together hundreds of thousands of dollars worth of parts from all over America, and then to sort them out and index them.

And even after all of this material was concentrated at Newcastle, it was impossible for any one man, however good his memory or however extensive his experience, to tell just what former model a certain part belonged to. The country was scoured for men who had worked with former companies in the various departments and who could probably tell from memory where certain drawings or jigs were, or which model of which make a certain part came from. At times the task seemed hopeless. Many drawings

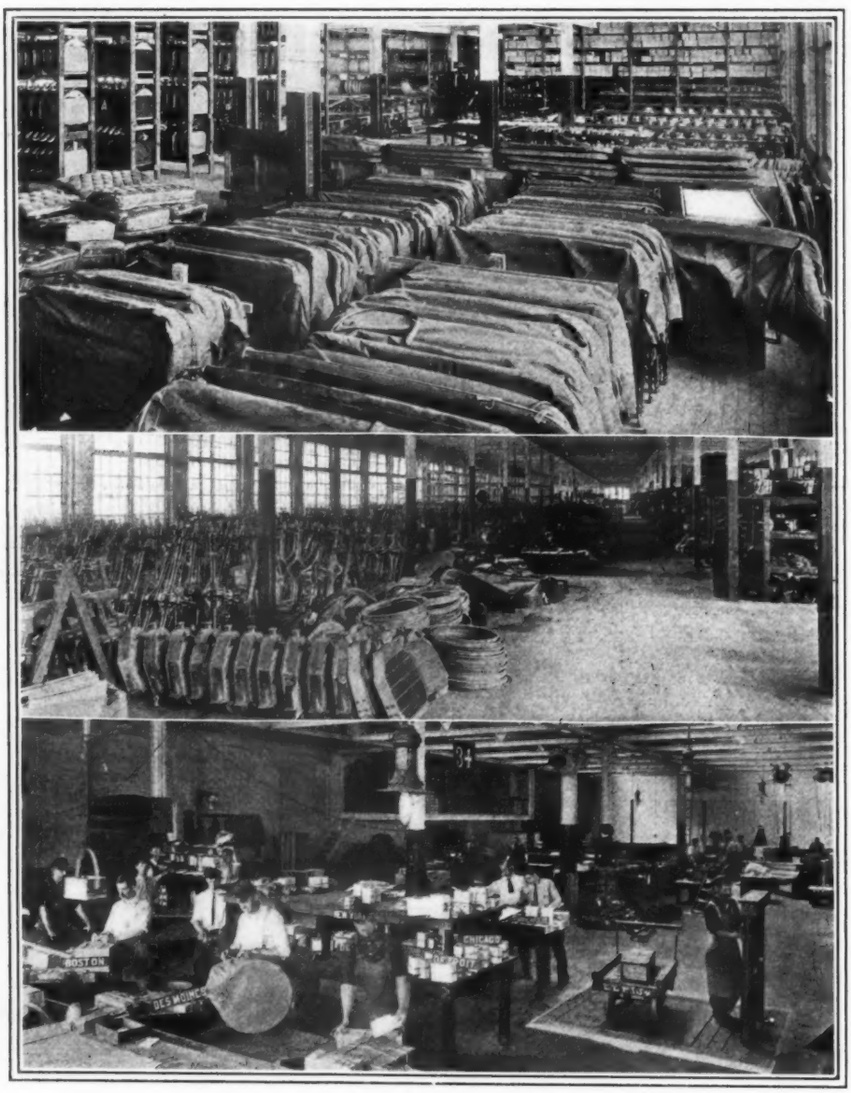


Stockroom Views in the Maxwell Service Factory

Top—One section of the 45,000 bins of parts
Upper Middle—A typical aisle in the stockroom
Lower Middle—One section for old-model radiators for 244 models
Bottom—Springs and axles in stockroom



Forge room used exclusively for forging spare parts for the 244 models



Miscellaneous Stockroom Departments

Top—Tops and radiators carried for old models
Middle—A corner in the axle stock department
Bottom—Parcel post shipping room for quick orders

had been lost or mislaid—and for some of the earlier models it seemed as if drawings had never been made.

Dayton Flood Adds to Work

Right in the midst of things came the Dayton flood, which destroyed a number of patterns belonging to Stoddard-Dayton models. Fortunately, the drawings were saved, and in the following weeks the lost patterns were replaced.

One hundred and twenty-six carloads of material were shipped from the various plants to Newcastle. This when it started and when it arrived was an apparently hopeless mass of mixed parts.

There was much grumbling among owners during the time this work of sorting was going on. The several months of suspense during the time the companies later purchased were in the hands of the receiver was added to by the delays which necessarily ensued while the material was in transit and in the course of sorting.

Deliveries on Daily Schedule

Out of the chaos has come order. The mixed masses of parts have given way to three floors of a well-ordered stockroom where the attendant can instantly lay his hand on any part of any of the 244 models. Having ascertained the shortages, the company immediately proceeded to make such parts as were not on hand. With very few exceptions, every part required can be furnished immediately. J. E. Burns, head of the service plant, states that 95 per cent. of the orders are filled within 24 to 48 hours after receipt.

$1,750,000 Invested for Service

Today at Newcastle, the Maxwell Motor Co. carries an investment of one and three-quarters million dollars in the form of plants, machine tools and repair parts for cars which the present company never built. It is the visible evidence of a moral obligation discharged.

Reducing the Cost of Tire Production

Inventor of the Pneumatic Tire Discusses Practical Developments in the Industry—Bits of History

By J. B. Dunlop

DUBLIN, IRELAND, Oct. 31—In my opinion reduction in cost of pneumatic tire production will not be achieved on the lines of the Michelin or Palmer. There is one point I ought to have mentioned in favor of the Palmer and it is the fact that all the strands in the cords are equally strained when the tire is in use, and I should also mention that the bead or hook lends itself peculiarly and automatically to equal strain of the two layers of cords. As I said, one fact that militates in a small degree against the Palmer is its cost of production and I understand it is not so easily repaired as some other tires. The Palmer has only one very minor structural defect to which I need not allude as it is of small importance in a tire possessed of so many good qualities.

Fabric and Rubber Cover Are of Equal Life

It is surprising how European manufacturers have been able to gauge the relative wearing qualities of the fabric and of the rubber composing the cover. In most cases these give out about the same time. When it has been found that the wearing qualities of the rubber are superior to those of the canvas it is advisable to inflate the tires just a little harder than average and thus save the canvas at the expense of the rubber. When on the other hand the canvas is superior to the rubber the tires should be inflated rather softer in order to save the rubber.

As I said, when roads to be traversed are rather rough, the tires should be somewhat softer than when the roads are level and smooth. When flinty or slaty sharp stones are plentiful on the road, tires should be pumped rather soft. Hard tires are more readily cut than soft ones. It is a mistake in any case to go to extremes in inflation.

Often Thick Rubber Terminates Too Abruptly

A mistake with some makers is to make the thick rubber at the tread terminate rather abruptly. This forms a hinge and the canvas gives out first between the tread and the side walls. In many cases the rubber between the layers of canvas gives way before the rubber leaves the canvas. This is due to carelessness or faulty manufacture.

I cannot say much about truck or solid tires, although I invented and patented the first solid tire vulcanized to the rim of a carriage wheel. The tires looked very neat and were used by myself and friends for many years before we were possessed of motor cars. Great improvements have been made in solid tires since then but I had an idea some years ago that makers were disposed to use a superabundance of vulcanite and that it was not properly graduated. I did not then consider that the metal rims were properly prepared for the vulcanite and I had some doubts as to the suitability of the rubber employed. I always considered solid tires good enough for horse-drawn vehicles.

Pneumatic Tires Needed for High Speed

Every person knows that the advantages of the pneumatic tire can only be appreciated where high speeds on the road are desirable or imperative, and in order to obtain high speeds on the road and to save power as well as to save and protect from injury the motive power, man or engine, it is absolutely necessary that the motor as well as the load should be carried on pneumatic tires. Needless to say the mere saving in horsepower would never compensate for the risks of puncture and trouble of inflation.

The honor belongs to the Dunlop Co. of being the first to apply the pneumatic to horse-drawn vehicles, but the department was not a commercial success. They were, I believe, also the first to apply the tire to motor cars, but the tire was hand built and the parts were pinned together with rubber solution unvulcanized and the tire was therefore not adapted to withstand the heat generated by high speed motors as a result of the tire friction on the road.

France Had First Good Automobile Tire

France has the honor of being the first to manufacture a practical commercial detachable double-tube pneumatic tire suitable for motor cars. The man in the street or the average man in the car can scarcely appreciate the consummate skill required to initiate and manufacture the Michelin tire. The motoring world undoubtedly owes a deep debt of gratitude to the pioneers of the motor tire industry. The objections that might be urged against the Michelin is that it requires skilled labor to manufacture it and is therefore a trifle too expensive and all the threads in the fabric are not subject to the same strain.

Perhaps I should mention that I was the first to patent a tire having a rubber air tube, the cover of which was held on by endless wires and held in position by air pressure. I also designed the rim in such a manner that the tire would not leave the rim when on the road whether the tire was inflated or had become accidentally deflated. This may be the reason why I am still partial to this type of tire for motors as well as for bicycles. It is said that there is a difficulty in manipulating this type of tire in sizes suitable for motor cars, but I do not think there is any difficulty that could not be overcome by a little perseverance. The difficulties in manufacturing suitable heavy tires of this type are to my mind as nothing compared with the patience and skill required to perfect the Michelin. It is only in recent years that the Michelin tire boot has been so improved as to render security bolts unnecessary. I never did pin my faith to mechanically fastened side flanges, detachable rims, or bolt-on type of tires. They all invite moisture and add seriously to weight. When I first thought of the tire I had a nightmare of horror at the bare possibility of moisture finding its way into the tire. It is not such a serious matter now since manufacturers have lined the tire cover with a film of rubber.

Club Insurance Saves $78,000 a Year

Members of Los Angeles Organization Have Profited to That Extent in the Last 12 Months by Novel Arrangement Whereby They Insure Their Cars and Themselves for a Nominal Sum

LOS ANGELES, CAL., Dec. 6—This city boasts of one of the livest automobile clubs in the land and to make good such boasts the club shows a profit of $68,000 to its members in the last 11 months by saving them this amount in insurance on their cars.

October 1, 1912, was the date when the Automobile Club of Southern California, with headquarters in this city, instituted its automobile insurance department and in the first calendar year the amount of premium deposits was $99,145.17, less $5,235.60 returned premiums by reason of cancellations of policies ordered cancelled before the end of the insurance year.

Doing this amount of business the club has saved to its members $78,000 in the first year's business. The $94,000 premiums on policies written would have cost the car owners at regular board rates $134,000, so that here alone is a $40,000 economy. But the plan goes further because the amount of unearned premiums being returned to the insured upon the expiration of cancellation of the policy exceeds 30 per cent., which means an additional saving to members of $28,000.

Personal Liability Premiums $30,000

The club insurance department in its first year of business has developed one more activity in that it has written for club members personal liability insurance in premium volume of practically $30,000. This insurance was written in an old line company at 25 per cent. discount to members, an additional saving of $10,000, which added to the $68,000 saved makes a grand total of $78,000.

Saving $78,000 to 2,500 insured club members means $31 per member. To club members this is a particularly good investment because the initiation to the club is but $6 and the dues $1 per month. For this insurance privilege the member pays $18, and, according to the report of the first year, has a saving of $31. In a word, he makes $13 by being a member of the club.

This is automobile club service to its members and Guy Van Alstyne, who is the manager of the insurance department of the club, claims that the club has profited by the addition of 1,000 members during the year. He goes further and states that the cost to the club of maintaining this insurance department has been absolutely nil in that the expense of management, clerical force, printing, stationery, etc., is charged *pro rata* into the cost of the insurance.

Special Department Takes Care of the Work

To do this insurance work for its members it has not been necessary for the club to become an insurance company or an insurance agency. The department of the club which handles the work is designated the Inter-Insurance Exchange, which is not a company but an organization of the insured club members who become members or subscribers through signing power of attorney, authorizing contracts of indemnity to be exchanged for and in behalf of each other, which is in accordance with the inter-insurance laws of California. Similar state laws exist in practically all other states and the plan furnishes one of the purest forms of mutual insurance possible.

When this club insurance matter was first considered the object was not one of making money for the club but rather of saving money for its members, and with this object in view the insurance department of the Royal Automobile Club in London, Eng., was examined and its method of operating reported to the board of directors. Unofficial figures for California showed that the loss ratio on automobile insurance did not exceed 35 per cent. of the premiums, so with this as a starting foundation it seemed certain that the club would as it desired save money to its members. Unofficial figures for 1912 show that premiums to the amount of $2,881,656.00 were paid in and that the losses were $823,407.00, a loss ratio of 28.5 per cent.

To carry out a definite insurance plan the club retained Mr. Van Alstyne as manager, he having been formerly in the insurance business in the state. The Inter-Insurance Exchange obtained its charter in October, 1912, and immediately began business. Ninety policies were issued the first month and from this soon rose to 200 per month.

Article 1 of the Rules and Regulations governing the conduct of the Exchange reads as follows:

"Risks shall be restricted to automobiles of the private pleasure car type. Only members in good standing of the Automobile Club of Southern California, or corporations or firms in which such members are officers or partners may be eligible to apply for insurance in the Exchange. Such insurance shall be limited to not to exceed two cars per member in the case of privately owned cars and to not exceed two cars per membership in the case of cars owned by corporations or firms except by special authority of the Executive Committee."

All lines of insurance applicable to the private pleasure car type are written in the Exchange upon payment of a premium deposit amounting to 70 per cent. of the Board rate therefor. The amount of the premium deposit is placed to the credit of the particular policy. The books of the Exchange are closed and audited monthly and the losses and expenses are computed in percentage of the total premium deposits in hand. Each policy is then charged with its pro rate of loss and expense for the given month. The following month the then remaining credit balance is similarly charged with a similar pro rate. When the policy expires or is cancelled the remaining credit balance is returned to the insured in cash.

The following is an actual example of how this works out in dollars and cents:

"In October, 1912, a member insured his car against fire and theft in amount of $1,800. Board rate for this policy was $45.00; it was written by the Club for $31.50. The member ordered a new car in June and cancelled his policy June 30th. He received cash return premium deposit of $15.18. The actual cost to him for his insurance during the nine months had been $16.34."

The policy issued is the standard form in use on the Pacific Coast as are various endorsements (collision damage full coverage, collision damage $25 deductible, property damage without deduction) attachable thereto.

The department has never entered the liability insurance business except to furnish same through connection with a Western casualty company which effects a saving of 25 per cent. on Board rates. The reason for this is self-evident: A contested liability claim generally means a law suit and law suits may be in the courts many years before they are finally decided and judgment rendered and has to be paid. By confining the hazards to those which are purely physical on which immediate determination of damage may be reached it is possible for all claims to be adjusted and paid without material disagreement.

In its adjustments the department has set a new standard for automobile insurance in California. Not every motorist can become a member of the Automobile Club and thus eligible to apply for insurance in the Exchange. The membership requirements are restrictive and all applicants undergo careful scrutiny at the hands of a membership committee, and if insurance is applied for the moral hazard is taken carefully into account.

Since it behooves the members to keep losses and expenses as low as possible as their own proportionate cost is lessened thereby, every person interested is naturally working toward the same end.

Instances are numerous in which the character of the service has endeared it to the insured.

The department handles an average of ten to fifteen claims a day and just as soon as it can be determined that it is liable on a loss and the extent of damages can be ascertained it pays and pays with a smile.

A few months ago an insured in a Los Angeles suburban town was summoned from his office to his home where fire completely destroyed his garage and car which he had stored therein. Unknown to him the Automobile Club had been notified by its local representative. Within an hour he received a telephone message asking if it were possible for an insurance adjuster from the Club to inspect the salvage. As the fire was too hot to go into that night the insured was somewhat astonished to be called out of bed the next morning to receive check in full for his loss. The adjuster had been working half the night, was on the scene of the fire by daylight, had arranged for sale of the salvage and was ready with check in payment of the face of the policy.

European Carbureter Development for 1914

Design Simplified—Tendency To Adopt Straight Venturi Tube with Circular Jet at Throat—Horizontal Type Appears

By R. W. A. Brewer

THE general impression gained from an examination of the various latest types of carbureters on the European market is that considerable attention has been devoted to the elimination of unscientific contractions which were only too prevalent in the earlier types of instruments. A more scientific knowledge of the principles of carburation has borne fruit in the simplification of design, and the result has made itself apparent in the general tendency to an adoption of the straight-through venturi tube with a circular jet orifice located at its throat. The development of block casting has led carbureter manufacturers to provide an instrument which can be bolted directly to the cylinder casting. Some of such types were shown last year, but the bigger manufacturers have now come into the field with horizontal instruments, the justification for which has yet to be proved.

Horizontal Type Eliminates Manifold

True it is that the adoption of the horizontal carbureter has led to that very desirable elimination, namely, the abolition of the inlet pipe. The inlet pipe is at the bottom of many of the carbureter difficulties experienced at the present time, these difficulties becoming more and more marked in proportion to carbureter difficulties as the instruments themselves become more perfect.

Along with the perfection of the carbureter should go the perfection of the inlet system, so that advantages gained in one direction may not be lost in another. With this object in view manufacturers have almost entirely adopted the system of coring the inlet passages to the various cylinders through the water spaces of the main castings, and as this is an important part of the carbureter system, it must be considered along with the carbureter arrangement.

Intake Manifold Dimensions

Generalizing on the induction pipe arrangement, first, the tendency is to make the pipe of a sectional area which is at least equal to the area through one of the inlet valves, and in cases of the 15.9-horsepower engine, for example, we find a cross-sectional area equal to that of a 40-millimeter diameter pipe quite common practice, and in connection with such a sectional area it is common to find the area through the venturi throat equal to that of a pipe of from 26 to 35 millimeters diameter; and taking, for example, a 26-millimeter throat, this will taper out to about 35 or 40 millimeters at the carbureter outlet, and continue with the same sectional area right through the casting to the valve pocket.

With a four-cylinder block engine opinion seems to be somewhat divided as to whether two transverse passages should be cored through the main cylinder casting from the two inlet valve pockets directly across the cylinder casting to a Y-branch on the carbureter side, or, on the other hand, an internal coring of the cylinder casting so that only one port of entry is provided to which the carbureter can be attached.

Where a Y-branch is used you generally find considerable care taken in its formation, and it is sometimes partly cast with the cylinder so that it can obtain heat from the waterjacket by direct means. On the other hand, occasionally there is a separate Y-branch which is water-jacketed at the junction of the three pipes, and in one notable case the area at this point is very considerable, the gas velocity is reduced here, the object of the arrangement, no doubt, being the provision of a gas pocket which can damp out pulsations in the inlet pipe and in a measure prevent them from coming back on to the nozzle of the carbureter.

Pulsations in Manifold

The question of inlet pipe pulsation has undoubtedly received further thought during the last 12 months, as we find several advices embodied in carbureter design in order to cope with the evil which results from these pulsations under certain circumstances. For example, we find in the Zenith and Solex a baffle-plate fixed at the main air inlet so that any gasolene which is blown out of the carbureter when reversals of flow are set up, is entrapped and drawn in again so that no waste occurs.

Reverting to generalizations on carbureters themselves, there does not seem to be any great consensus of opinion with regard, for example, to the sizes of the floats and float chambers, and in the following notes are given definite values for the dimensions of these parts. Attention, however, is drawn to the fact that in the Claudel the float chamber of the cyclecar model is exactly of the same dimensions as the float chamber of the latest model Z-type of 24 millimeters, which has a 34-millimeter gas outlet. It would appear, therefore, that the size of the float chamber does not have any particular bearing upon the performance of the instrument. Provided that the flow of gasoline into the float chamber is sufficiently rapid to cope with any particular demands of the motor at times of pick-up, there is no object in having a large reserve of gasoline in a float chamber.

Automatic Air Valves Gone

Of all the instruments which were shown at the recent Olympia show there was not one single model of any note provided with any system of automatic extra air valves, although one supplementary device, which will be referred to later, was exhibited for controlling an additional supply of air to the inlet pipe, but this was carried out by direct operation of the gas velocity through the pipe.

There is a tendency in some quarters toward the control of the amount of fuel passing to the motor at the will of the driver, and whilst one or two manufacturers realize the importance of this function, yet one notable manufacturer has discarded the method of operation from the driver's seat.

Claudel-Hobson Racing Type

In addition to the standard model of instrument this firm is putting out what is known as the Z-type of racing model and also the cyclecar model, which in general principle resemble its arrangement with barrel-throttle, having specially shaped cuts or claws through which the air passes to the mixing chamber situated in the center of the throttle barrel. The notable development in the design of this instrument is that the throat of the venturi is now situated below the throttle, a short entry being given to the venturi throat, and the expanding taper commencing just below the throttle barrel and continuing through it and through the upper portion of the carbureter body to the connecting flange. For example, taking the 24-millimeter Z-type,

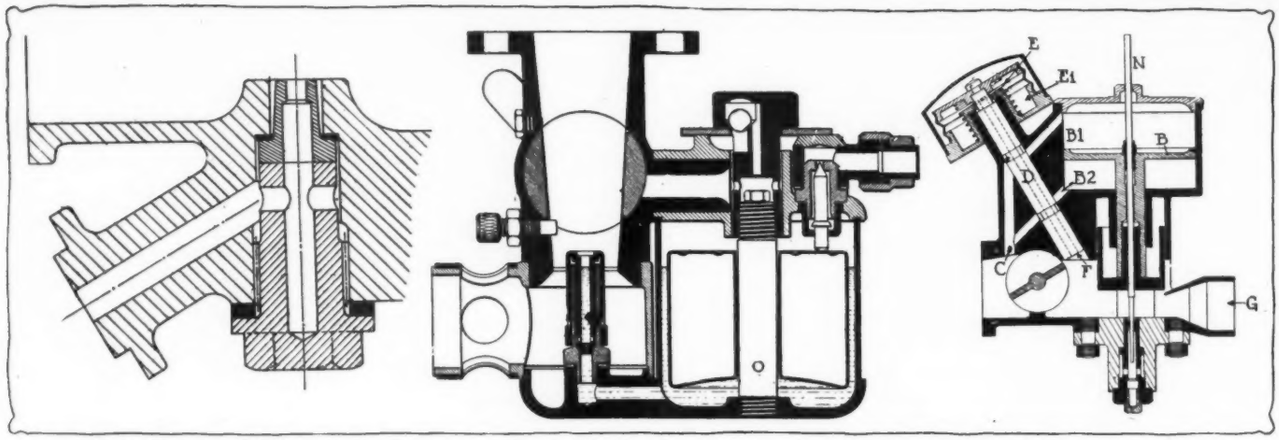


Fig. 1—Taper modulating pin for S. U. type. Fig. 2—Section through vertical Solex. Fig. 3—Brown & Barlow in section

this is provided with three main air inlets situated at right angles to each other, 34-millimeter diameter, and converging round the base of the jet. The throat of the venturi, which is situated a few millimeters above the point of convergence, is about 10 millimeters long and 24 millimeters in diameter, and the expanding taper cone is 80 millimeters long, and in that length expands from a diameter of 24 millimeters to one of 32 millimeters, the length of the total venturi being 95 millimeters. It will thus be seen that this is an exceptional length of venturi for the size of instrument under discussion. The effective area through the throat must naturally be reduced by the amount of space occupied by the jet, and this latter is 14 millimeters in diameter, but under conditions of maximum working allows a certain amount of air to be drawn through it.

The fuel control is by a center slow-running jet of 0.60 millimeters in diameter, and the fuel for high speed work enters the jet by two holes, each one 1.05 millimeters in diameter situated at the base of the outer tube. Fig. 5 shows the standard type of jet. The principal feature of the racing jet is the well of gasoline situated between the outer and inner shrouding tube, so that when the throttle is opened there is an immediate demand of gasoline which can be met by this reserve in the shrouding tube.

In the Z-type instrument the diameter of the float chamber is 40 millimeters, as against 57 millimeters in the ordinary pattern, and the size of the float in the Z-type is 39 millimeters in diameter by 27 long, as against 55 millimeters in diameter by 43 long in the ordinary type. The Z-type float chamber is exactly the same size as that of the cyclecar model, which instrument has the following features:

The choke is 20 millimeters in diameter, the air entry being circular at one side of the instrument, and is 26 millimeters in diameter. The usual bypass arrangement is made for slow running at the upper or engine side of the throttle, and by means of a grub screw the small bypass can be regulated to allow the necessary amount of mixture to pass with the main throttle shut. In other respects this model is a small edition of the standard model.

Approximate List of Claudel Sizes

Bore of Engine. Mm.	Size for 1 or 2 Cyl. Mm.	Size for 4 or 4 Cyl. Mm.	Bore of Engine. Mm.	Size for 1 or 2 Cyl. Mm.	Size for 4 or 4 Cyl. Mm.
60	16	16	100	24	26
65	16	18	105	24	26
70	18	20	110	26	28
80	20	22	120	28	30
90	22	24	130	32	32
95	22	24	Above	36 upward	

For motors with a stroke more than 1.5 times the bore, the next size larger carbureter is required. The above only applies to engines with normal revolutions of between 1,000 and 2,000 per minute.

Brown and Barlow Resembles S. U.

The Brown and Barlow 34-millimeter type has an air inlet and gas outflow of that dimension. This instrument, Fig. 3, is very similar to the S. U., but it apparently divides up the S. U. principle into two stages. The taper needle in this instance is attached to the unit which comprises the solid plunger and the large air piston and is held in a small frictional clip so that the tail end of the needle N, which projects through the top of the cover, can be rotated in order to give the needle an upward or downward adjustment. The air plunger in this case has a maximum travel of 32 millimeters, a diameter of 38 millimeters, and the operating disk, to which the plunger is attached, has a diameter of 75 millimeters, and it is upon this diameter that the engine suction operates the whole system. The bellows-controlled piston valve, or stem D, has a valve controlling the effect of engine suction which passes up through passage C to the port, either B_1 or B_2, according to the position of the plunger. The position of this plunger is controlled by the air bellows E_1 through the medium of the hole F, which is drilled through the center of the plunger D. The spring E operates in a contrary direction to the engine suction. Both the ports B_1 and B_2 are arranged so that they have a slight amount of lead, and by this means the large air piston B does not hunt. The butterfly throttle is of cast metal and is 37 millimeters in diameter. It will be noted that the main air inlet G is so arranged that a hot-air pipe can be attached to the circular connection so that when the valve first lifts hot air only is admitted past the jet, and as soon as the valve B lifts further cold air is allowed to pass to the upper portion of the air inlet port G. The float chamber of this instrument is 70 millimeters in diameter by 72 millimeters deep, and the float is 65 millimeters in diameter by 45 millimeters deep. The fuel control is by a long center level with toggles on top of the float.

Solex a Combination Principle

The Solex is a somewhat interesting instrument, being apparently a combination of the Claudel and the Zenith. Its similarity to the Claudel is in the arrangement of the venturi formed of the instrument body and the throttle barrel, which is shown in the cut, Fig. 2. The horizontal Solex, however, is made with a removable choke tube, and taking for example the 35-millimeter type, this has a main outlet of 35 millimeters in diameter, the series of chokes to fit this instrument varying from a minimum of 19 millimeters to a maximum of 28 millimeters. These chokes are put in position in the vicinity of the jet at the lower part of the venturi cone. A notable development in the throttle barrel is the chamfering off of the sharp edges of the air and gas ports to eliminate noise which is invariably set up by this type of throttle with a sharp edge. The positive stop for controlling the slow-running position of the throttle is arranged by allowing the chamfered edge to come in contact with the set-screw fitted in the body of the instrument. The diameter of the throttle barrel is generally parallel, about 27 millimeters in diameter, expanding to the outer 35 millimeters in a total length of expanding cone of 36 millimeters. The main air inlet in this instrument is now covered with a bell, so that in the event of blow-backs the fuel is retained and taken up by the incoming air.

Taking now the sizes of jets and choke tubes for this type of instrument, the general arrangement is for the submerged jet to be 1.10 millimeters in diameter with a 22-millimeter choke, and the subsidiary jet from 55 up to 80 or 100, i.e. 0.55 to 1 millimeter, according to the air leakage and the valve stems of the motor. The top of the main jet outlet is 10 millimeters from the bottom or rear end of the throttle when shut.

The horizontal type of Solex, which has just been described, is very similar to the vertical type which is illustrated in Fig. 2, excepting that in the horizontal type the air stream passes at right angles to the jet across the top of it, and in order to eliminate the baffling effect of a jet tube of such a large diameter in the horizontal instrument a small extension is carried from the top of the jet tube, the appearance of which is something similar to the Z-type jet in the Claudel, so that the fuel is carried up to about the center of the main air inlet passage. The float chamber of this instrument is 68 millimeters in diameter by 68 millimeters deep, and the float is 61 millimeters by 48 millimeters deep, the float lifting directly on to a needle with a taper point fitting on to a knife-edged seat.

In the vertical type of Solex the top of the jet is 10 millimeters below the throttle, and it will be noted that the Solex has discarded entirely the old double-vaned type of throttle in favor of the barrel type.

In the consideration of the sizes of venturis and jets of the Solex and the Claudel, it is evident that the gas velocities produce depressions up to about 25 to 30 inches of water under maximum conditions of working, or, say, 300 feet air velocity per second through the instrument.

Table of Solex Adjustment

For a single cylinder engine, reduce the bore by 10 per cent.
" six " " augment " " 20 "

Size of the carbureter.....	22	26	30	35	40	46	52
Number of the main jet.....	85	95	110	135	150	175	200
Number of auxiliary jet.....	45	50	55	60	65	75	75

Smith 3-Liter Carbureter

The Smith carbureter for a 3-liter engine is nominally the 30-millimeter, which has an opening through the throttle of 35 millimeters. This allows for the obstruction of the throttle itself. The four jets have no definite relation to one another with regard to the amount of fuel which they pass through, but taking the choke of 11 millimeters in diameter for each, the smallest jet will pass about 20 cubic centimeters of petrol per minute, the gas opening of the automatic valve at that time being 25 millimeters by 6 millimeters, and as each jet and choke is of a similar dimension, and the automatic valve opens through equal vertical lifts in order to bring each combination of jet and choke into operation, we find, for example, that the third jet begins to work when the air valve is 14 millimeters up, i.e. has lifted 8 millimeters. The size of the Smith carbureter for any particular engine is determined in the first place by the maximum output of power from the engine. For an example, an engine of 69-millimeter bore by 130-millimeter stroke has a 30-millimeter carbureter, an engine 75 millimeters by 130 millimeters has a 35-millimeter carbureter, an engine 100 millimeters by 130 millimeters has a 40-millimeter carbureter, and engine 120 millimeters by 150 millimeters a 45-millimeter carbureter, an engine 130 millimeters by 160 millimeters a 50-millimeter carbureter, and in the case of a six-cylinder engine, the next size larger instrument.

For racing purposes, where maximum revolution is all that is necessary, a carbureter 10 millimeters bigger in the bore than used for standard sizes is necessary.

The depression or vacuum under which the Smith instrument works never exceeds 6 inches of water head, and is always constant no matter what the engine speed, and by reason of this low depression the jets are naturally considerably larger than are met with in any of the ordinary types of instrument. By using a larger jet the possibility of choking is almost entirely eliminated. Each jet is calibrated by the number of cubic centimeters of liquid which it passes per minute at the same head of water at which the carbureter suction works. With reference to the size of the float chamber the Smith people find that they get better satisfaction with a large float, and the following are a few examples of jet sizes, each figure being the amount of cubic centimeters of fuel passed by the jet per minute:

Crossley engine—80 x 120—carbureter size 30 millimeters, jets 25, 40, 35 and 30.

Twenty-twenty-five Overland—carbureter 30 millimeters, jets 25, 35, 30 and 20.

Sunbeam 16/20 horsepower—carbureter 40 millimeters, jets 35, 45, 35 and 30.

S. U. Has Horizontal Type

The S. U. horizontal type of instrument is typical of modern design where the carbureter is directly attached to the water jacket of the engine, and a port is cast through the water jacket so that a single flange-fixing allows the hot water to pass round the carbureter jacket without necessitating any pipe connection.

Taking the horizontal type which is made for the Darracq motor, this is nominally 35 millimeters, and the size is equal to the equivalent area through the aperture below the floating piston at maximum lift, that is, the maximum bore of the choke. In this instrument the diameter of the outlet is 38 millimeters and the inlet is 38 millimeters. The air piston is 35 millimeters in

(*Continued on page* 1114)

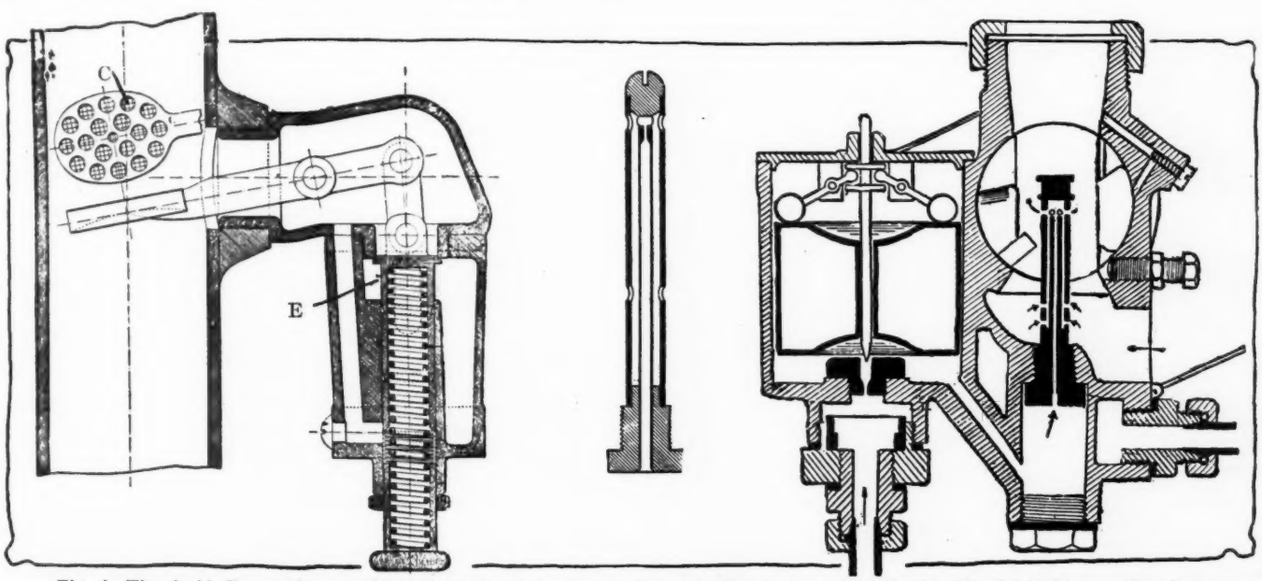
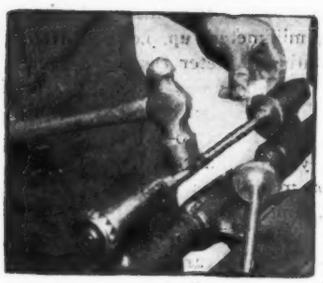
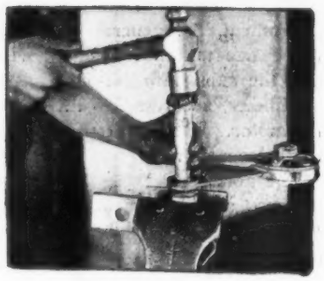


Fig. 4—The A. V. Economizer. Fig. 5—Standard jet. Fig. 6—Cross-sectional view through the Claudel-Hobson racing type



The Rostrum



Reader Believes That Underslung Frame Does Not Lower Center of Gravity

EDITOR THE AUTOMOBILE:—It seems to me that it is about time that something was said on the advantages and disadvantages of the underslung frame. It gives a car a racy look and that is all, for it is easy to prove that this construction does not lower the center of gravity of the car except in so far as the actual mass center of the frame is changed nor does it permit of bringing the body closer to the ground.

The positions of the body and the power plant are the two factors that determine the center of gravity. Now, regardless of frame location: the height of the body is determined by the gearbox because the body floor must be above the top of the gearbox or at least not much below it. And in turn the distance from the top of the gearbox to the ground is determined by how near the flywheel or the bottom of the crankcase, whichever is lower, can be brought to the road. Thus it is seen that the frame location has nothing to do with the center of gravity.

It is true that a low car with very high wheels and over slung frame would require a very large kick-up at the rear in order to clear the axle but this disadvantage is more than offset by the extra parts required for underslinging.

NEW YORK CITY. H. F. B.

Plowing with a Touring Car

Editor THE AUTOMOBILE:—Two Ohio farmers have discovered that the power developed by an old touring car can be employed for work as well as pleasure. L. W. and E. J. Badger, living near Bellefontaine, have converted their car into a plow and have demonstrated that it is much more effective and economical than the horse-drawn plow.

Lee Badger drove the motor-plow on one side of the 30-acre field at their farm while his brother Edwin drove a four-horse team on the other side. The horses toiled laboriously along, while the automobile sped along at a 4-mile-per-hour gait.

"We tried a steam traction engine one year, and last year we tried a gasoline traction with the truck of a steam engine, but they were too heavy, so this year we rigged up this outfit," said Lee Badger. "The gasoline and oil to run the plow cost us about $1 per day. Last year plowing cost us $2.50 a day and then we had to hire teams to do it. If we were hiring teams this year it would cost us more than that.

"Besides the expense there is a great saving of time. With the auto we can make about 4 miles an hour, which is 50 per cent. faster than the four-horse team can go, because the team must stop and rest occasionally. In a 10-hour day the motor plow will cover 3.5 to 4 acres, and we are plowing 8 and 9 inches deep, while our neighbors are using horse-drawn plows in the same kind of soil and go but 4 and 5 inches."

While using the automobile as a plow the brothers leave off the rear wheels and the body. The rear axle serves as a jackshaft. There is an eight-tooth sprocket on the axle where the rear wheels ordinarily fit and this pulls on a fifty-four-tooth sprocket which is fastened to the traction wheel. Levers are rigged up so that the driver can manipulate the depth of furrow and operate the simple machinery.

When the brothers wish to take a jaunt about the countryside they merely release the plow machinery, fit on the rear wheels and body with the result that they have a touring car.

Cleveland, O. J. D. RARIDAN.

Method of Finding Horsepower

Editor THE AUTOMOBILE: 1—What is the best way to find the horsepower of a motor?

2—What is meant by speed-ratio?

3—Can the speed of the car be determined by the revolutions of the engine?

4—What is the advantage of a long stroke motor?

5—What is the best way to remove carbon?

Cleveland, O. S. A. W.

—1—There are several ways of determining the horsepower of a motor, any one of which may be the best under certain circumstances. The horsepower may be found by actual test or by the application of some formula which has been deduced from former tests. Horsepower formulas are merely rough approximations because of the many and widely varying factors that affect motor output, such as carbureter adjustment, size of valves, motor speed; for these reasons when it is desired to know the horsepower with any degree of accuracy a test must be made.

The S. A. E. formula, in common use, assumes that the bore is the only variable. This formula is used as a guide as to the actual horsepower.

There are an endless number of devices for measuring the actual output of a motor, and for this reason only one will be described. It is the type recommended by the American Society of Mechanical Engineers and is known as a rope brake, Fig. 3. A coil of rope is passed around the flywheel, the upper end being fastened to a spring balance and the lower to a heavy weight. The motor output is absorbed by the friction of the rope on the flywheel surface, the friction tending to lift the weight and reducing the reading on the spring balance. The actual load at the rim of the flywheel is equal to the difference between the lower weight in pounds and the reading on the spring balance.

An understanding of just what a horsepower is will enable a clearer understanding of the methods of measuring it.

One horsepower is equivalent to doing work at the rate of 33,000 foot pounds per minute; a foot pound of work being de-

fined as the raising of a mass of one pound against the attraction of gravity through a distance of one foot. So horsepower may be represented by the equation:

$$\text{horsepower} = \frac{\text{foot pounds of work per minute}}{33{,}000} \quad (1)$$

which is the same as saying:

$$\text{horsepower} = \frac{\text{force in pounds x distance in feet}}{33{,}000} \quad (2)$$

On the rope brake, illustrated, the force in pounds, mentioned in the above formula, is the net pull exerted at the flywheel rim and is equal to the difference between the weight W and the reading of the spring balance w. The distance through which the force acts is equal to the rim travel of the flywheel per minute, which is equivalent to the flywheel circumference multiplied by the revolutions per minute. Symbolizing these quantities and substituting the formula (2) we have:

$$\text{h.p.} = \frac{(W - w) \times 3.14 \times \text{r.p.m.} \times 2R}{33{,}000};$$

where W = weight of large weight,
w = pull registered on spring balance,
R = flywheel radius in feet.

The formula in common use for estimating the horsepower of a motor is the S. A. E. formula:

$$\text{h.p.} = \frac{D^2N}{2.5}$$

where D = cylinder bore in inches,
N = number of cylinders.

This is derived from the more general expression given below, but which is nothing more than an application of equations 1 and 2.

$$\text{Brake horsepower} = \frac{\overset{\text{(Total force)}}{P \times A \times N} \times \overset{\text{(Distance)}}{E \times S/4}}{33{,}000}$$

where P = 90 (assumed average pressure during power stroke),
A = area of cylinder in square inches,
N = number of cylinders,
E = 0.75 (assumed mechanical efficiency),
S = 1,000 (assumed average piston speed in feet per minute).

Substituting we have:

$$\text{Brake horsepower} = \frac{90 \times 0.7854\, D^2 \times 1{,}000 \times N \times 0.75}{33{,}000 \times 4}$$

and combining the numerical values:

$$\text{Brake horsepower} = \frac{D^2N}{2.489} \text{ or } \frac{D^2N}{2.5}$$

—2—Speed ratio is not a definite term that describes the relative speeds of any two particular parts about an automobile, and these only, but one that may be used in describing the rotative speeds of any related parts such as crankshaft to cam or magneto shaft, to change gears or rear axle set. Gear ratio, however, is often used in referring to the relative rotative speeds of the drive shaft and rear axle shafts.

—3—As there is a positive connection between the motor and the rear wheels of an automobile the speed of the car for any given motor speed can be easily calculated, as shown by the formula:

$$\text{m.p.h.} = \frac{.00297 \text{ x r.p.m. x tire diameter in inches}}{R}$$

R is the speed ratio between motor and rear wheels. On direct drive this is equal to the gear ratio of the rear axle and on other speeds R is the product of the reduction in the gearbox and rear axle.

When using this formula it must be borne in mind that a certain maximum motor speed does not necessarily mean that enough power would be developed at that speed to enable the car to attain the corresponding speed indicated by the formula.

—4—For a given piston displacement, the long-stroke motor has been stated to have the following advantages over the short-stroke; reduced wear on rotating parts and lessened vibration because of the lower rotative speed required to give the same output; increased mechanical efficiency due to the fact that the pistons are lighter because their diameter is smaller; less distortion of the cylinder and piston due to heat; slightly lower temperature and pressure of the exhaust gases in the cylinder.

—5—It is impossible for us to say just what method is best for removing carbon. There are several methods in common use; two of which are entirely mechanical and the rest chemical in their action. The most common way is to remove the cylinders from the crankcase and scrape the carbon off with a screw driver or some such instrument. But recently tools have been put on the market which do away with the necessity of taking down the engine. The tools are so shaped that all parts of the cylinder interior can be reached and scraped clean by unscrewing the valve caps and inserting the tools in these holes.

A chain carbon remover is another device that cleans the carbon out without the necessity of tearing down the engine. A small piece of strong wire chain is inserted into the cylinder through one of the valve cap openings and the motor is run at a moderate speed on the other cylinders until the carbon is loosened up, by the chain striking the top of the piston and cylinder alternately.

Burning the carbon out with the aid of pure oxygen is a method that has come into common use quite recently and is found entirely satisfactory. First cover the front parts of the car with damp cloths to protect the varnish from being scorched by sparks, which sometimes fly out of the cylinder. Because of this caution it must not be thought that this method is unsafe. Remove the valve caps and place a small piece of waste saturated with kerosene in the port or cylinder. Fill the cylinder with oxygen and light the waste. Supply enough oxygen to maintain combustion until all the carbon is consumed. Often a taper is used instead of the waste. The oxygen is supplied from a tank under pressure and is led to the cylinder through a rubber hose which has a length of brass tubing on the end that is inserted into the cylinder.

Besides these there are several liquid carbon removers which are claimed to loosen the carbon by merely filling the cylinder and letting the solution stand in it for a while.

Kerosene has a tendency to loosen up carbon, but it is a preventive rather than a cure. It is recommended that a little be squirted into each cylinder when the car is put up for the day and while the engine is still warm. This will postpone the time when a thorough cleaning by one of the methods previously described will be necessary.

Wants To Rig Up Dual System

Editor THE AUTOMOBILE:—Will you kindly tell me whether or not it is possible to wire up a Bosch single-system magneto with a single-unit coil, so as to form a duel system with battery using the circuit breaker and distributer on the magneto?

I have noticed that three of your subscribers are interested in the effect a damp night has on the running of a motor. I have read that the extra power is developed through the turning of the water vapor into steam by the heat of combustion, so that

Fig. 1—Old four-cylinder Winton touring car used for hauling gang plow. When plowing is over the car is fitted up and used as a touring car

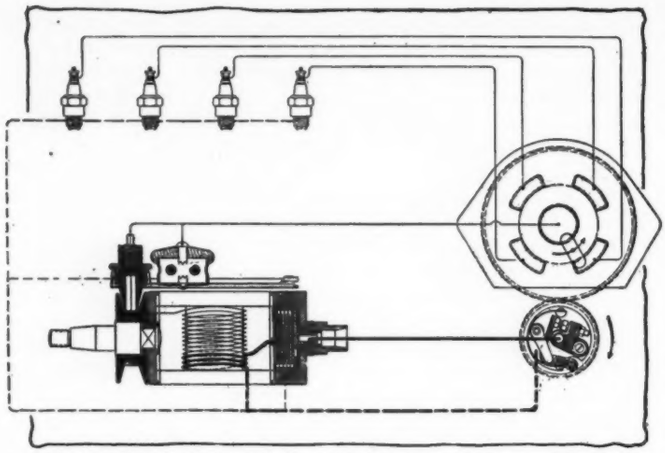


Fig. 2—Bosch single system magneto wiring diagram. The heavy black line shows the path of the current through the primary circuit

there is some steam engine effect. I see no reason why this could not be so, but I have another possible explanation. It is a fact that when steam is passed over carbon heated to 1,000 degrees Centigrade carbon monoxide and hydrogen are formed. Why could not this chemical action take place inside the cylinder of an internal combustion engine when steam is formed from fog of the atmosphere? For I do not believe carbon would ever be lacking. Carbon monoxide and hydrogen are both highly inflammable gases and they could easily combine with some unused oxygen giving an additional amount of power. If this is the case, I should think that water vapor would be a good carbon remover.

Orange, N. J. REDFIELD BIRKHOLZ.

—It is not possible to wire up a Bosch single-system magneto with a battery as you suggest because there is no way of connecting the battery to the primary circuit of the magneto. This can be seen by inspecting Fig. 2, in which a diagram of the wiring is given, the primary system being shown in heavy lines. It will be noticed that the wiring is self-contained and that there are no points to which the battery may be connected.

Your suggestion that moisture ought to provide a good means for burning the carbon out of the cylinders does not work out because the carbon never gets hot enough to decompose the water and combine it with the oxygen in it. For that matter, before this would happen the carbon would unite with the oxygen in the cylinder but it never gets hot enough to even do this.

The Thermo-Syphon Cooling System

Editor THE AUTOMOBILE:—1—Will you kindly publish in THE AUTOMOBILE the principles of thermo-syphon cooling system?

2—Of late my Cutting car overheats after a run of 30 miles. Some time ago I used a radiator compound to stop a leak and would like to know if it has stopped up the system?

Lowell, Mass. C. E. WILLIAMS.

—1—Water circulation in the thermo-syphon system depends on the fact that warm water is lighter than cold water and therefore the warm tends to rise to the top and the cold to fall to the bottom. Thus, circulation is obtained by the water in the jackets becoming heated and rising through the outlet manifold to the top of the radiator. At the same time the cooler water in the bottom of the radiator flows into the jackets.

2—The overheating of your motor is probably caused, as you suggest, by the application of the radiator compound but, not knowing its chemical composition, it is impossible to say just how to remove it. We suggest that you try flushing out the water passages with a hose.

If you find that overheating is not due to the compound look for a loose fan belt or it may be that the pump is not working properly. If the latter is the case, the top of the radiator and the discharge pipe from the cylinders will be very hot and the lower part of the radiator and discharge pipe comparatively cool. Overheating might also be caused by faulty lubrication, too rich a mixture, badly carbonized cylinders, or running with the spark retarded.

Metz Front Axle Construction

Editor THE AUTOMOBILE:—1—Will you kindly advise me how the steering knuckle is connected to the tube on the front axle of a Metz runabout, also what is the length of the steering knuckle which is in the tube?

2—What is the inside and outside diameter of the tube?

3—Would it be advisable to drill and tap for a 5-8-inch bolt through the tube and steering knuckle?

Jersey City, N. J. A. J. ROMER.

—1—The steering knuckle is connected to the front axle tube by brazing.

2—The inside and outside diameters of this tube are respectively 1.125 and 1.75 inches.

3—This would not be advisable.

The Number of Tires Made Annually

Editor THE AUTOMOBILE:—Would you give me an estimate of the number of automobile tires manufactured annually in the United States, also the number of bicycle tires manufactured.

Kingston, Ont., Can. J. F. SPARKS.

—In the United States there are annually about 10,000,000 automobile tires manufactured and about 2,000,000 bicycle tires manufactured.

Danger from Kick-Backs

Editor THE AUTOMOBILE:—I think it fair to state through your columns in justice of the Westcott car and its makers that the clutch trouble I mentioned and possible reasons for which were pointed out in your Rostrum of November 6 in all probability was due to my lack of knowledge in changing gears.

My Klaxon horn is giving splendid service now since following both yours and the factory's directions to clean and oil the cummutator.

1—Please let me know why there should be more danger of kick-back while cranking from magneto than battery or *vica-versa?* I was under the impression that danger was less with battery spark lever fully retarded. The reverse seems to be true, and I almost invariably crank with magneto, fearing a kick from dry battery.

2—If I knew of a reliable and simple self-starter, not too complicated to install, I would be glad to get in touch with the manufacturers.

E. M. BLACKSHER.

Brewton, Ala.

—1—With spark fully retarded, there should be no danger

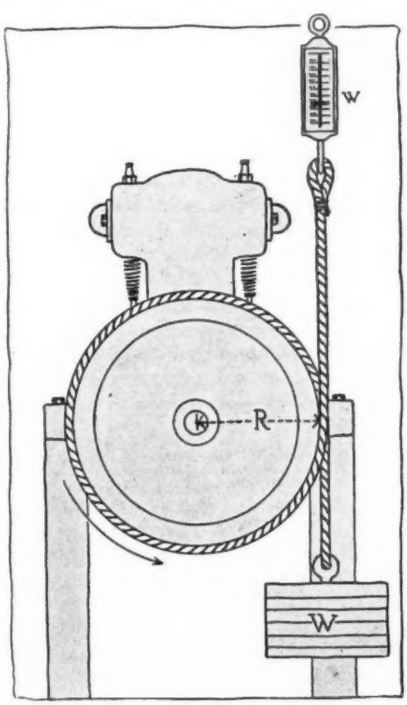


Fig. 3—Rope brake for measuring horsepower. The rope is passed around the flywheel attaching at one end to the spring balance w and at the other to the weight W

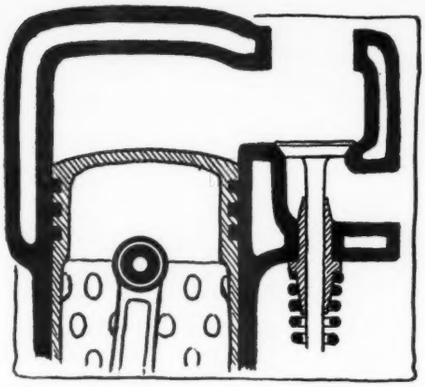


Fig. 4—Cross-section through L-head motor giving an idea of how holes are drilled in the pistons to lighten them, thus allowing motor speed to be increased

from kick-back with either system, providing the timing is correct and there are no short circuits that might cause the spark to occur before the proper time. See if the timing is all right by retarding the spark lever and noticing whether the spark occurs before or after the piston passes upper dead center. If the spark occurs before, then you will get a kick-back.

It is interesting to note here that with spark half or three-quarters advanced there is practically no danger of kick-back when cranking on the magneto, although it would be certain on the battery. The reason for this is that the motor has to be turned over quickly in order to generate a spark, and its inertia at this speed is sufficient to carry it past dead center even when the explosion due to the advance tends to rotate the motor in the other direction.

2—THE AUTOMOBILE cannot advise you on this matter, but suggests that you make a study of the self-starters advertised in it and from which you can undoubtedly make a satisfactory selection.

Information Concerning Selden Car

Editor THE AUTOMOBILE:—1—How do you take up the play in the steering gear of a 1911 Selden?

2—How does the oiler on this car work?

3—Is it possible to obtain a license without the factory number of a car?

Celoron, N. Y. M. H. T.

—1—The play in the 1911 Selden steering gear may be taken up by slackening the set screw and nut at the top of the gear housing, and turning the large adjusting nut down.

2—The motor lubricating system used on the Selden car is the constant-level splash type in which the oil is contained in a reservoir in the bottom of the crankcase. A gear-driven vane pump circulates the oil from the reservoir to the troughs in the crankcase into which the scoops on the connecting-rods dip. These scoops splash oil to all points requiring lubrication.

3—In New York state a license cannot be obtained unless the factory number of the car is given, according to the New York City office of the secretary of state.

Making a Tension Rod Tough

Editor THE AUTOMOBILE:—Not long ago a gentleman came into my shop with two broken tension rods which had ruptured at the termination of the thread about as indicated in Fig. 5. These rods were threaded on each end, one a right-hand and the other a left-hand thread. The thread being an odd one and my shop not being equipped with the proper dies, the only means at my command for cutting the threads was the lathe, which I used, cutting a sharp, well-fitting thread.

The country being rough and the driver rather careless my careful repair did not last long. He soon came back with the rods broken in the same place. I repaired the rods as before, cautioning my customer to be more careful, but to no avail. He broke them again.

Then I began thinking that there was something wrong with the rods—that they were not elastic enough. The stress was obviously too high at the root of the thread—at the point where the rod always broke. I concluded that, the stress being greatest there, the stretch must also be greatest at the same point—hence the rupture. It would be better to turn down the rod to a diameter equal to the diameter at the root of the thread, thus distributing the stretch over a 6-inch length. The finished rod is shown in Fig. 5. This slender portion was turned on one end only which is obviously all that was necessary.

No more trouble was experienced.

There is nothing new about this method of construction but I believe it is new as a repairman's kink. It has long been known that a rod is less liable to break if the diameter of the rod between the threaded ends is about equal to or less than the diameter at the bottom of the thread. Would it not be well for designers to make more use of this method on tension parts subject to shock?

New York City. W. F. SCHAPHORST.

Cannot Run Klaxet from Magneto

Editor THE AUTOMOBILE:—I have frequently been asked by my customers if it is possible to wire up a Klaxet or other small electric horn on a Splitdorf or Remy magneto, so I call on you for the information.

Plumsteadville, Pa. J. H. GILBERT.

—An electric horn of the Klaxet type cannot be operated from a magneto because it requires a direct current, while the magneto generates an alternating current.

How to Speed Up Rutenber

Editor THE AUTOMOBILE:—I have a six-cylinder Rutenber motor 3.75 bore and 5.25 stroke on which I would like to make the following changes:

1—I intend to perforate the skirts of the pistons and center of the connecting-rods to reduce weight. Do you think this practical?

2—Will a piston perforated in this manner last as long as the regular way?

3—Do you think the lubrication of the rings and wristpin will be as effective with the piston perforated?

4—Do you think it will weaken the connecting-rod by perforating the center web?

5—How much gain in power can I expect by making these changes?

Jersey City, N. J. THEODORE BERGER, JR.

—1—It will be all right to perforate the pistons as shown in Fig. 4, and to drill the webs of the connecting rods slightly if it is desired to increase the speed of the motor.

2—A perforated piston will not last as long as one not drilled because it has not the same wearing surface, but it is doubtful whether the decrease in wearing qualities will be sufficient to prove objectionable.

3—This change ought not to interfere with lubrication.

4—It will not weaken the connecting-rod very much to drill the web, but, then, on the other hand, the weight of material removed is so small that it is questionable as to whether it is worth while.

5—It is impossible to estimate the increase.

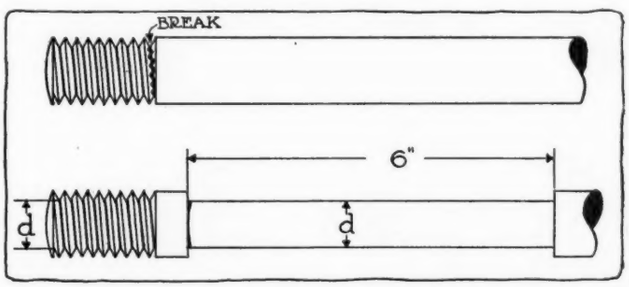


Fig. 5—Upper view shows original form of rod and where breakage occurred. Lower illustration gives method of effecting repair

Gray & Davis Use Planetary Reduction

Starting Motors in Three Sizes —High, Medium and Low Speeds

IN order to provide for the widely varying requirements of the car builder the starting motors of the Gray & Davis Co. are made in three types. All are cylindrical in shape and two of the three are exactly similar in diameter, but the fields and windings are arranged so that the most efficient operating speed of the three models ranges from 1,500 revolutions in the low-speed machine to 3,600 in the high-speed model.

All three models are supplied with or without internal reduction gear incorporated in the end cover. Two methods of drive are used as standard: (1) By means of the internal gear mentioned, in conjunction with silent chain to the crankshaft or by connection to the timing gear. (2) By the sliding gear method in which the driving pinion is provided with means for meshing with teeth in the periphery of the flywheel. This latter is a method meeting with increasing favor. The usual practice of interconnecting the starting switch of the motor with the mechanism which operates the sliding pinion is the method used.

The cylindrical casings of the motors are plain, Fig. 1, and are fitted in cradles or brackets curved to accommodate them. By this means it is a simple matter to send out a motor as a standard and leave the fitting to the car builder and the peculiarities of the engine to be equipped. The use of the inclosed gear also does not necessitate any difference in the design of the magnet casing. The end cover containing the gear is fitted in the same way as the plain bearing at the opposite end of the machine.

Fig. 1—Starting motor with sprockets for chain drive

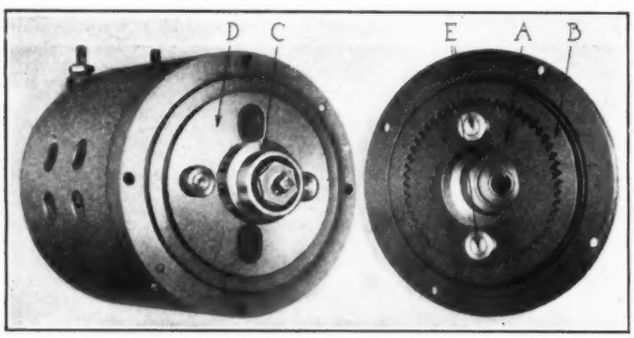


Fig. 2—Planetary reduction gear in end cover of Gray & Davis starter

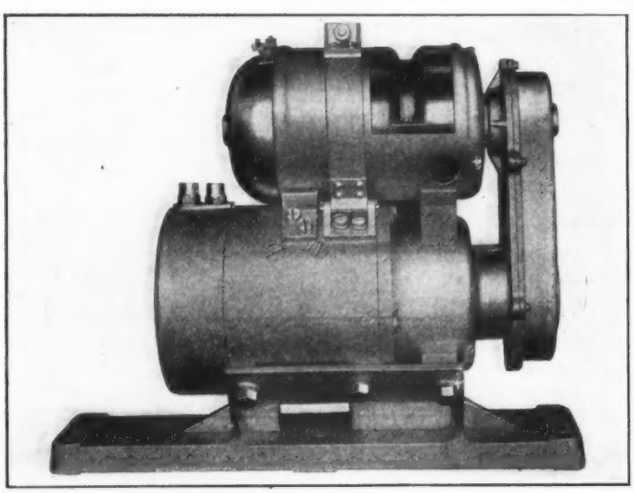


Fig. 3—Duplex design of Gray & Davis starting motor and generator

Planetary Reduction Gear Used

The internal reduction gear used on the Gray & Davis motors is unusual in that the planetary form has been adopted, Fig. 2. An eccentric, C, containing rollers in its periphery, is mounted on the end of the armature shaft where it operates in the center of the first gear wheel A. This wheel is prevented from rotary movement by the two rollers E which slide in slots in the fixed member D behind the eccentric. Thus a kind of wobble motion is transmitted to A which imparts a much reduced rotary motion to the outer wheel B. The action can be described as a sort of differential creep between the two gear wheels, the outer one being forced by having more teeth to lag behind the speed of the motor shaft. This form of reduction gear has the advantage of taking up a small space.

In fitting the flywheel model to an engine the motor may be located in front or behind the flywheel. As applied to the Lozier, Fig. 4, the motor is mounted in a cradle on the crankcase ledge with the sliding gear inclosed in a case attaching to the flywheel housing. In this particular equipment the generator is also carried on the same side of the motor as shown.

In another typical installation, Fig. 5, the motor M is carried on a bracket bolted to the side member of the chassis subframe under the footboard. Immediately behind the flywheel is situated a transverse rock shaft which carries at the right the starting pedal P, in the center a shifter fork which slides the driving gear G into mesh with the flywheel and at the left a crank connection to the switch S. The reduction gear is inclosed in the casing R. Pressure on the pedal slides the pinion into engagement and closes the switch simultaneously. A spring fitted to a crank on the rock shaft returns both to the "off" position on releasing the pedal.

Switch Contains Starting Resistance

The switch used in the flywheel equipment is of the two-step sliding contact type, a resistance being inserted between the two positions. This is necessary to avoid clashing of the gears when starting. On the first movement of the starting pedal the current is forced to pass through this resistance, which is contained in the switch casing, and the motor is given just sufficient speed to render meshing easy. As the teeth come into full engagement the resistance is cut out and the full power applied. An interior view of a two-step sliding switch is shown in Fig. 6.

In the other type of starter, Fig. 1, where the turning effort is transmitted through chain, no starting resistance is needed as the train of gear is permanently in mesh. A simple one-way switch of the push type for foot operation is generally used in this case.

Curves obtained from the three models, H1, H2 and K, are shown in Figs. 7, 9 and 8, respectively. The low-speed machine H1 has a four-pole field, and is fitted with four brushes. H2, the medium speed model, has two poles fitted in the same diam-

eter field casing as H1. The diagram, Fig. 8, shows the performance of the high-speed model, Type K, which is a light two-pole motor with two brushes.

The following characteristics are common to all three models: The magnet frame is a steel casting in each case. They are all plain series wound. All have laminated poles and all poles are wound. The brushes are of a low resistance carbon composition. The principal dimensions and weights appear in the table below:

Type	Speed rating	Overall length	Diameter	Weight	Reduction ratio
H1	1,500 r.p.m.	10⅞"	6⅝"	45 lbs.	15 to 1
H1 with internal gear	1,500 r.p.m.	13¾"	6⅝"	59 lbs.	15 to 1
H2	2,600 r.p.m.	11⅞"	6⅝"	42 lbs.	26 to 1
H2 with internal gear	2,600 r.p.m.	14 11/16"	6⅝"	56 lbs.	26 to 1
K	3,600 r.p.m.	11 7/16"	5¾"	31 lbs.	36 to 1
K with internal gear	3,600 r.p.m.	13 15/16"	5¾"	38 lbs.	36 to 1

The general similarity of performance of the three motors is noticeable in the three curves. The efficiency is around the 70 mark in all cases, and the torque curves display the same steep characteristic which is desirable for starting purposes. All are for operation on a 6-volt circuit, this being the standard voltage of the Gray & Davis lighting equipment.

Duplex Design Now Marketed

In some cars the spaces around the engine are such that it is not feasible to provide separate locations for the lighting and starting units. To meet these requirements a duplex model consisting of a generator and motor mounted on the same base and connected by inclosed chain, Fig. 3, is marketed. This type of electrical equipment has the advantage of requiring only one geared connection to the engine, generally by chain. This chain thus takes both the drive from the motor when starting the engine and the power in the opposite direction when the engine is running for driving the generator. An over-running clutch is fitted on the motor shaft so that the motor is stationary except when required for cranking the engine. The brush gear of both units is readily accessible at the end opposite the gear casing.

The connection of the two units of a double-deck design by inclosed chain marks a departure from ordinary practice in this particular. A point worthy of notice is that the gearcase is quite separate from the end covers so that the entire motor and generator is standard, exactly as supplied for individual fitting. The two units are held together by a steel strap attached to the motor casing.

The generator is of the standard type containing a centrifugal clutch at one end which insures a constant speed of the armature shaft irrespective of the speed of the engine. The field winding is compound. One of the advantages of the constant-speed compound-wound generator is that the voltage is constant whatever happens in the external circuit. Should a battery jar or terminal, for instance, be broken, the lamps will remain properly lighted at the rated voltage from the generator alone.

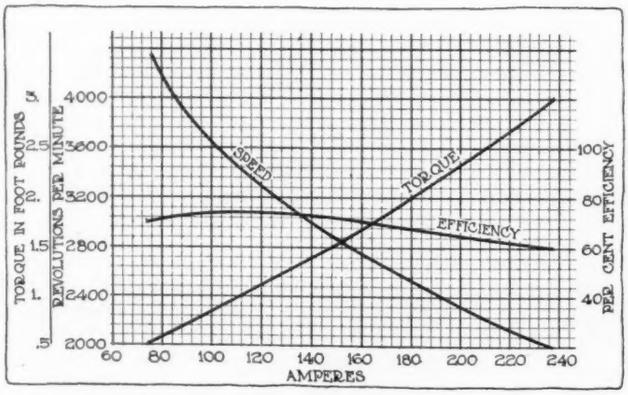


Fig. 8—Speed and torque curves of high-speed cranking motor

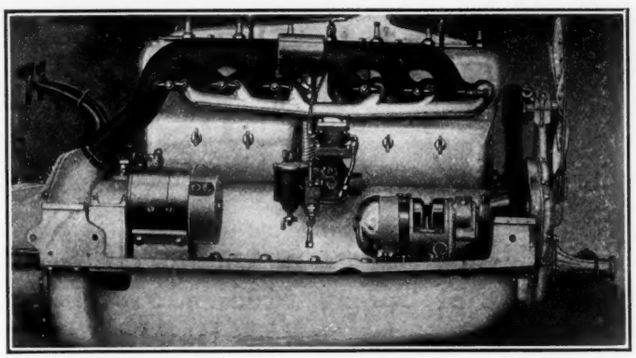


Fig. 4—Gray & Davis motor and generator as applied to Lozier

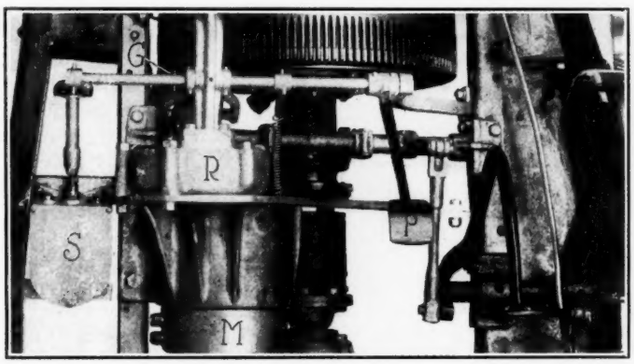


Fig. 5—Behind flywheel application of Gray & Davis starter

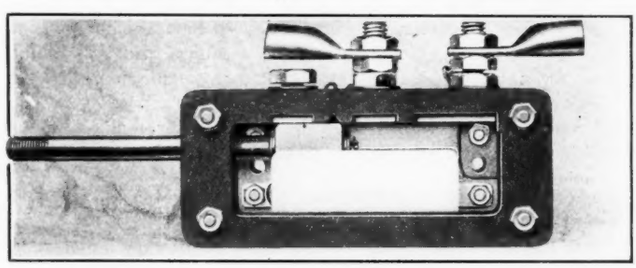


Fig. 6—Two-point sliding switch interconnected with drive pinion

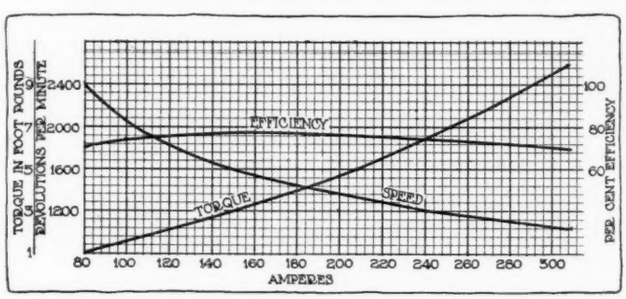


Fig. 7—Characteristic curves of low-speed starting motor

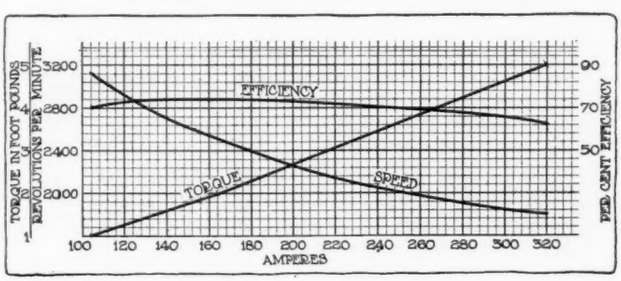


Fig. 9—Curves obtained from test of medium-speed starting motor

The Engineering Digest

Summary of the Main Considerations in Design of Speedy Modern Motors, as Seen by British Builder

ELEMENTS of High-Speed Automobile Engine Design.—Under this title L. H. Pomeroy recently presented a paper before the North of England branch of the Institution of Automobile Engineers on the subject which is now most actually before all automobile builders who have not given it ample attention during the long development by which the high-speed motor of up to 3,000 revolutions per minute has finally become practicable. The following is a summary of the treatise as it appears in *Internal Combustion Engineering* for November 12, the aim being to gather the more important facts and views in the smallest space possible.

Until six years ago all automobile engines suffered from insufficient breathing capacity. The remedies which have been developed since may be classified in their order of importance as follows: (1) Valves of adequate diameter and ports to suit, (2) valve gear capable of operating reliably at high speeds, (3) high compression to obtain rapid ignition at high speeds, (4) carbureters with unrestricted choke tubes and air passages, (5) light reciprocating parts, (6) forced lubrication.

A number of other characteristics of modern high-speed motors are mainly incidental to the technical progress found necessary for incorporating the six features mentioned.

Valve areas govern the power developed irrespective of cylinder size, over a wide range, the small motor making up by additional revolution capacity what the large motor gains by cylinder capacity.

The Breathing Valve Most Important

It is the size of the inlet valve which is of primary importance, as the intake action, operated by suction only, cannot be forced. The exhaust valve can be relatively small, as the piston can force the burnt gases out.

In a touring car motor it is possible to obtain about 4.5 horsepowers per square inch of inlet valve or port area with a lift equal to 1-4 of the valve diameter. The maximum power capacity can be further increased by changing the cam profile, so as to bring the opening and closing points of the valve farther apart, but in that case the torque at low speeds suffers.

High Speed Gives Two Top Gears, Almost

The standard valve setting in motors of the author's design makes the inlet open 5 degrees past high center and close 45 degrees past low center; it opens the exhaust 45 degrees before low center and closes it 20 degrees past high. This setting favors torque at high speeds somewhat without sacrificing acceleration at low road speeds unduly. Some makers profess that the life of a motor is lengthened by fitting small valves and restricted exhausts to limit the motor speed. But what happens when the maximum speed of an engine is, for example, only 1,400 revolutions per minute is that the amount of gear-changing required becomes much greater than with a high-speed motor. Where the latter can run on third the car with the low speed motor must come down to second and here the motor roars away with much wear and tear and without any compensation in the form of hill-climbing speed.

It is one of the notable qualities of the high-speed motor that it enables a car to be almost as fast on third as on top gear, due to the fact that on a gradient calling for this gear the motor revolutions can be increased, and the power in like proportion.

For maximum horsepower at 2,200 revolutions and capacity for increasing the speed to 2,700 revolutions without much loss of torque, 1 square inch of inlet valve area per 100 cubic inches of total cylinder volume is suitable, unless the valve lift is reduced in order to ease the work on valve springs and gears, in accordance with a practice now gaining in favor in view of the demand for silence. If, however, the valve lift is reduced and the valve area increased in proportion, the valve edge comes so close to the sides of the combustion chamber in a small cylinder that the gases do not pass easily and much of what is gained by the increased size is again lost.

Valve Lifts and Weights

Overhead valves eliminate this difficulty but, as yet, mean higher cost of manufacture. There is no doubt that overhead valves will pass 20 to 30 per cent. more gas than valves of the same size in the orthodox position. With a single camshaft and the valves all in a row, 75 per cent. of the valve circumference is useful, as against only 50 per cent. in the case of valves opposite each other. As, at best, valve size is limited in the small cylinders under consideration, the author prefers a valve lift of about 1-2 inch and somewhat abrupt cams giving quick opening and closing.

Mathematical consideration shows that the lift which the valve theoretically should have in order to make its discharge capacity equal to that of the port for a given suction pressure, port and valve being of equal diameters, should equal the diameter divided by 3.06, instead of by 4 as usually given in textbooks. But it is scarcely practicable to utilize such a high lift in practice, owing to the resulting strains on valve springs and the noise.

Another calculation shows that the acceleration of a valve operated at 2,400 motorshaft revolutions per minute by cams of ordinary shape, giving an approximately uniform acceleration, reaches 2,130 feet per second and that the force of the spring must be 50 pounds if the weight of the moving valve and valve gear parts is 4-5 pound. This shows the need of long springs to avoid overloading the tappet gear when the valve is fully open, the longer spring requiring less force per inch of compression.

The reduction of reciprocating valve weight is of greater importance for admitting high speed than the reduction of the inertia forces due to the piston and connecting-rod.

With a given valve and operating gear it is possible to pass a larger weight of gas into a large cylinder than into a small one. This indicates that for a given piston stroke a larger valve is required in a small cylinder than in a big one. The ideal would seem to be a valve large enough to pass sufficient gas at any motor speed without much advance or retard of the opening and closing moments. [This is apparently the object sought by another method by designers who force the explosive charge into the cylinder under pressure and by a special construction of the carbureter when extra speed and power are needed.—Ed.]

No Good Carbureter Yet

Carbureters which give excellent service on old engines fail utterly when required to give good vaporization at all speeds without wire-drawing and restriction at high speeds. This accounts for the carbureters with many jets, each with a choke tube of its own. There is need of developing a surface carbureter, with unrestricted flow at all speeds, for speedy motors.

High compression is not so essential for the production of high mean effective pressure as for effecting rapid ignition at high speeds. It should be highest in small motors in which the ignition is more sluggish. A ratio of 5 to 1 is suitable for cylinders of 2 1-2 to 3 liters capacity and 4.8 to 1 for larger sizes. But it is unfortunately not easy to make the compression chamber small in a small cylinder when the valves have to be large.

Lightness of reciprocating parts affect mechanical efficiency and vibration only. Heavy pistons squeeze the oil from the bearings but otherwise do not affect the power.

Inertia and Explosion Change Place

A motor would last longer if there were two explosions per cycle instead of one, as the wear caused by the explosions is secondary to that caused by the forces of inertia, as these are active at each end of the four strokes. At speeds of 2,200 to 2,400 revolutions, the inertia force approaches that due to an explosion and, being active so much longer, causes more wear and tear. This is also proved by the fact that crankpins wear on the side nearest the crankshaft axis.

Why Short Stroke Is Preferred

Another aspect of the inertia forces relates to the sweet running of the motor. Those arising from rotating masses are easy to deal with, as they are constant for a given speed. The reciprocating masses have usually been dealt with theoretically under the assumption that there is no play in bearings and no whip in shafts or connecting-rods. In the author's opinion there is no doubt, however, that the periodicities and unbalanced effects which arise from play and whip are important and are overcome far better by the big bore and short stroke combination than by small bore and long stroke. The unbalanced forces set up by the reciprocating parts are primary and secondary. The first are the same in magnitude as the centrifugal force due to the mass of the piston and a part of the connecting-rod would be if concentrated at the center of the crankpin. The secondary forces depend upon the same masses but also upon the relation between the length of the connecting-rod and that of the crank. The usual mathematical development of this subject shows that the secondary forces are in excess of the primary forces at the top of the stroke and smaller at the bottom, and so much larger as the relative length of the crankthrow is greater. They are consequently of a high periodicity and should be reduced to a minimum. Upon this consideration a preference for a short stroke, if not a long connecting-rod, for high-speed motors is based.

Rigidity, Cooling and Oiling

Rigidity by construction, not by added material, is the salient feature of modern motor designs. Some details on this subject are presented.

A host of heat transmission problems follow in the train of the high-speed motor. At bench tests the stem of every exhaust valve becomes a bright red by a run of 15 minutes at 2,500 revolutions. This makes it desirable to keep the size of exhaust valves down, as they can then more readily be kept cool. The author holds that the carbonization, so frequently complained of now, is mainly due to the high heat in the combustion chambers of high-speed motors. Formerly the motors smoked and now they do not, and this change cannot be accounted for as due to improvements in lubrication. Hence the carbonization has probably taken the place of the smoking.

White-metal bearings cast directly into the connecting-rod ends and main bearing caps are preferable to loose shells, as a film of oil gets in between the shell and the bearing cap, preventing conduction of heat and keeping the oil hot. Oil pressures are a question largely of clearances and oil grooves. The clearances should be .002 of the shaft diameter. Oil grooves should be abolished, as they bring metal in contact with metal and waste the oil.

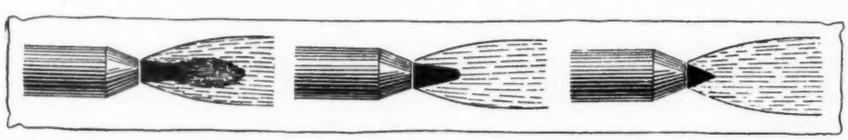


Fig. 1—Oxy-acetylene flame: Left, excess of acetylene; middle, correct formation; right, excess of oxygen

Adjustment of Oxy-Acetylene Flame

EVEN volume parts of acetylene gas and oxygen burn with a flame whose temperature reaches about 4,000 degrees centigrade, when thoroughly mixed, but in practice, when the two gases must be kept separate and mixed only just before the moment of ignition, the amount of oxygen required for complete combustion is about one-third larger than that of the acetylene. The flame from an oxy-acetylene burner is composed of a central jet 3 to 4 millimeters in diameter and 10 to 15 millimeters long, and this is surrounded by a much larger and much less luminous flame. The highest temperature is at the end of the inner jet. For work purposes the flow of the acetylene is regulated so as to make the inner jet as long as possible while yet avoiding the formation of a whitish plume in front of it which indicates an excess of acetylene. The whitish plume forms intermediately between the white central jet and the larger blue outer flame. The contour of the jet should be absolutely sharp, but if it does not reach a length of from 8 to 15 millimeters, according to the diameter of the nozzle of the burner, it is because there is an excess of oxygen, which reduces the heat of the flame and may cause oxidation of the metal to which the heat is applied, thereby spoiling a soldered joint, for example. An excess of acetylene, on the other hand, causes blisters in an autogenous weld, as the soldered joint produced by this method is called when no foreign metal is employed to form it, and may introduce carbon in iron or steel material. Exact regulation of the flame is therefore of the highest importance for obtaining a good quality of work as well as the greatest economy and speed. The accompanying illustration, Fig. 1, gives an idea of the three typical appearances of the flame.

By looking at the contour of the jet in the illustration representing perfect adjustment, it will be seen that the end is rounded, which is the shape producing the highest quality of work both for welding and cutting of metal. This shape is obtained when the gas pressure is just sufficient to assure the stability of the flame. A very pointed jet is liable to burn the metal, requiring higher skill in handling. In the shops high pressures, medium pressures and low pressures are all used, however, and with a high-pressure burner the amount of oxygen which it is proper to use, and which makes the best flame, is reduced to very little more than the amount of acetylene, while with low-pressure burners twice as much oxygen as acetylene may be required.—From *Revue de Mécanique*, August.

Inaccuracies Due to Fiber Tension

WHILE it is generally understood that castings and forgings of irregular shape are likely to be distorted when subjected to heat treatment and that it is one of the objects of a final grinding to correct such distortion, it is not so widely realized that the irregular internal stresses which may exist in a piece of material after it has been machined to accuracy of dimensions often are released and take effect in a considerable distortion solely as the result of minor subsequent machining by which a small amount of material is removed in a manner not quite symmetrical with the conformation of the piece. Two examples are mentioned which may furnish a clue to the cause of inaccuracies in other instances.

A cast iron spurwheel, Fig. 2, with a four-armed spider is required to be true to pitch within an error of .02 millimeter. It is turned to perfect concentricity with

its hub and the teeth are formed on a milling machine shaping the side of a tooth by a single cut. In spite of all precautions, this wheel and others like it always hammer in the mesh four times for each revolution when put to work, and measurement between the teeth shows variations from true of .06 to .1 millimeter. Finally the method is adopted of dismounting the wheel after all the teeth have been cut, mounting it again and cutting them over, and as this operation is light and can be done with increased speed the extra cost compares favorably with that of correcting the errors by trying and fitting. After the second operation the wheel is found accurate enough and no longer knocks at the four places. Measurement shows that these places are always those marked *a* midway between the four spider arms, and it is therefore evident that the cause of the inaccuracy lies in the readjustment to fiber tension which takes place in the weakest spots after the material between the teeth had been removed.

In the second case there was question of a cast-iron plate, Fig. 3, which after it had been planed showed the required accuracy. When it was mounted in the machine to which it belonged, it drooped along lines running from about the middle to all four corners, *d*, the variation from planity amounting to as much as .8 millimeter. The reason for the deviation was that two rows of small holes were drilled in the plate for its attachment in the machine, and it was found indispensable, in order to correct the warping to give the plate a second planing after the holes were drilled. [Yet it would seem that one planing might be sufficient if the holes were only drilled first—Ed.]—From *Werkstattstechnik*, September 1.

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European Carbureters for 1914

(*Continued from page* 1105)

diameter with a maximum lift of 25 millimeters, and the depression within the instrument is equal to 8 inches of water head.

In taper modulating-pin control instruments of this type it is very important that the modulating pin should centralize with the jet, and for the purpose of this centralization Fig. 1 shows the arrangement of the S. U. jet, and the method of operation is as follows:

The size of hole in the jet orifice is .090 inch, and in assembling the instrument a jet needle of exactly this dimension is placed in position and the loose jet orifice, which, it will be seen, is a clearance fit, is placed in the bottom of the casting and a soft metal joint ring is put on to this flange. The locating plug is then screwed up home and the jet orifice self-centralizes itself. The taper needle is then withdrawn. With regard to the needle there is no special example, as the needle must suit the engine for which it is designed. The method of determining the various tapers is by trial at specified engine speeds, the lift of the needle is noted and the diameter of the pin which gives the best results is then noted. These various trial points are then combined and the final design is embodied in the pin.

The S. U. carbureter is made in many forms to suit the various engine makers; some have a tail rod on the plunger and some do not.

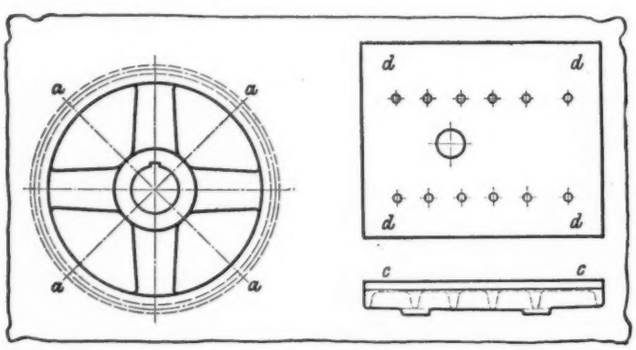

Fig. 2—Spurwheel that warped when teeth were milled. Fig. 3—Plate which warped when holes were bored

Wolseley Eliminates Leaks

The Wolseley arrangement, which was designed to eliminate air leakage, does not permit of any communication between the outer atmosphere and the suction side, but such air leakage is practically negligible, as the suction on cranking the motor should lift the air piston. The depression within this instrument varies from 8 inches up to 13 inches at maximum position of working, and the size is so arranged that the piston only reaches the top of its travel at maximum engine demand. For example, with a certain type of motor 46 brake horsepower was developed with the 1.5-inch model at 2,000 revolutions per minute, and after this point there was no increase in power, but when the instrument was replaced by one of 1.75 inches in diameter, 52 brake horsepower was attained at 2,500 revolutions per minute, that is, the speed and the power both increased. The bellows which operates this instrument is designed experimentally. For example, the air piston is 1.125 inches in diameter with .75-inch lift in the 1.25-inch model, the air piston is a clearance fit and does not touch the guide. No dash pot effect is required, as the bellows looks after this. The air piston in its lowest position is located on its own rim, which touches a seating made in the body of the instrument allowing just sufficient air to pass for slow running. The guide of the plunger is along its stem, and in the 1.25-inch model this guide is 1.25 inches long and .3125 inch in diameter, and the air hole up the center which operates the control is 3 millimeters in diameter. A butterfly throttle in this instrument passes through a split throttle spindle and is located by two pins. This takes all the load off the fixing screws and makes a very neat arrangement.

A. V. Fuel Economizer

The A. V. fuel economizer is illustrated in Fig. 4 on page 1105 and consists of an attachment to the induction pipe of a motor which controls an additional supply of air through the valve E. A gauze-covered palm C is located in the air stream, and the air velocity causes this to lift at high engine speeds, and this opens the additional air valve E in correct proportion, allowing air to enter the induction pipe and thus produce a weaker mixture at high engine speed.

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Causes of Errors in Tests of Metals

It is pointed out by a French authority that in applying the hardness test the metal under examination is likely to undergo slight surface hardening.

Experiments were carried out to determine whether tensile strength tests would give a better idea of the exact physical state of metals. Similar bars of carefully annealed silver were rolled to various extents whereby different degrees of hardness were obtained. The hardness of each bar was determined, the tensile strength test applied and then the hardness again determined. It was found that the tensile strength, although giving no indication of slight degrees of hardening, increased regularly with the extent of hardening and the elongation diminished.

When the bar broke under a slight load, and the elongation was considerable, there was a marked increase in hardness after the tensile strength test, but in the case of the hardened metal, when the elongation was slight, there was even a diminution in the hardness after applying the tensile strength test.

Further experiments on brass and on aluminum showed very conclusively that the strain on the metal did not increase the hardness unless the metal underwent appreciable elongation.—From *The American Machinist.*

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The *ecrouissage*, or upsetting of the normal crystalline formation, which is produced in a metal by hardening or mechanical working has been defined recently as "any special molecular condition which may be removed by annealing." The new definition is offered by Ch. Frémont.

Climbing Pike's Peak By Automobile

Motor Loses Power and Water Boils Easily at High Altitudes

By O. W. Hall

WHILE on a trip up Pike's Peak by automobile a few weeks ago, the writer had the opportunity of investigating the phenomena governing the action of automobiles under conditions existing at high altitudes. The highest point reached was the summit, 14,147 feet above sea level, the starting point being Colorado Springs, Col., at an altitude of about 7,000 feet.

It is generally known that the power of the gasoline engine gradually decreases as the altitude increases, owing to the rarefaction of the atmosphere. This is due to the fact that, although the gas spray nozzle is fixed and always furnishes the same amount of vaporized gasoline at a given revolutions per minute, the amount of air is varied according to the altitude, and thus the fine adjustment of the carbureter is disturbed. In order to compensate for the rarity of the air, it is necessary to either cut down the proportion of gasoline to the air by means of the adjustable needle valve, or else to increase the size of the air opening. With this car in question, an auxiliary air device was fitted before the climb, in anticipation of trouble from this source.

Of the two methods given above, the former has the disadvantage of cutting down the total amount of gas entering the cylinders on account of the gas being cut down to compensate for the diminished air supply. The latter method, while eliminating the trouble just mentioned, has the disadvantage of making an extremely rare mixture which explodes all right as long as the engine turns over at a good speed, but which permits the engine to die suddenly as soon as the revolutions per minute drop below a certain point. With the aid of an adjustable air device both these difficulties are eliminated, as the proper amount of air may be supplied for any and all speeds without danger of losing the engine at a critical point.

In going up the Peak, a noticeable loss of power was experienced when timber line was reached at an altitude of 10,500 feet, and the engine, if allowed to idle, exhibited the exact symptoms of an over-rich mixture. By adding extra air the normal power was to a large degree restored. In climbing one of the last steep, rocky stretches, which had to be jumped 6 to 10 feet at a time, the full supply of air was given to the engine to produce its utmost power. Time and time again the engine was lost on account of the driver being too busy with the steering wheel to watch the air lever, thus allowing the engine to die of gas starvation. Even with the most advantageous adjustments of gas and air, the lack of power was extremely noticeable, and all steep places had to be rushed.

Low Boiling Point of Water

A great deal of time was lost on account of the necessity of replenishing the water supply in the cooling system. The boiling point lowers as the altitude increases and the water therefore evaporates much more freely than at sea level. Potatoes cannot be boiled at the summit because they never get above a temperature of about 185.5 degrees Fahrenheit. The accompanying chart, Fig. 1, shows clearly the relation of the boiling point to the altitude; how it drops gradually and uniformly as the height increases. Roughly, this drop amounts to about a degree Fahrenheit for each thousand feet of rise. At and near the summit the water in the radiator would boil on the least provocation.

It was interesting to note the change in adjustment required when passing through the dense masses of cloud which hover about the Peak, this being due, in all probability, to the moisture contained therein. No fixed rule could be determined as to the exact adjustment necessary for different conditions, as the climb was so steep and rough that it was next to impossible to take any observations. Generally speaking, however, the presence of the moisture seemed to make for a slight power increase in the engine. In view of the recent controversy on this matter, the writer does not wish to go on record in saying that there seemed to be an increase, as snow and sleet were falling the larger portion of the time, and kept the atmosphere in a more or less saturated condition.

A very peculiar and unexpected phenomenon occurred upon nearing the top, one which has never been mentioned in any of the automobile journals as far as the writer knows. This was in regard to the tires. One of the rear tires gradually became soft through leakage of air from the valve, and after it had become about half deflated an attempt was made to inflate it with a hand pump. But in spite of repeated trials and in spite of the fact that the pump was in perfect working condition, it was impossible to get any air inside the tire. The attempt was finally given up and the trip resumed. When the summit was reached another attempt at inflation resulted in the same way; it could not be inflated. As the casing was not bumping the descent was made to an altitude of about 9,000 feet, and there an attempt resulted in perfect success. One of the tires had been pumped up before the start from Colorado Springs, so that it is known that the pump was in good order.

The reason for this failure on the part of the pump was not due to any imperfections in its mechanism, but was due to the rarefaction of the atmosphere at altitudes above 11,000 feet. This figure is for this pump; others would in all likelihood have a different point at which they would fail to work. The pump cylinder, when filled with air at low atmospheric pressure, had to use the greater portion of the piston stroke in raising the charge of air to normal pressure at sea level, and the rest of the stroke was used in compressing the charge. But the compression obtained thereby was apparently insufficient to open the tire valve against the internal pressure, and for that reason no air could be forced inside. It may be readily seen that a puncture under such conditions is quite a calamity, because of the inability of the pump to inflate the tube after repairing or replacing. The only sure method of eliminating stoppage from this source is to have an engine driven compressor or else an air bottle. With the aid of these no trouble should be expected.

A Source of Danger

It is perfectly possible that a tire, filled to its limit of pressure on a cool morning, and at a low altitude, will be subjected to an abnormal pressure upon reaching a high altitude. The reason for this is quite clear when it is considered that the atmospheric pressure drops to about 8.1 pounds per square inch at 14,000 feet, while the air within is expanding continually, because of the outside pressure being removed. The effect of the rays of the sun is to heat the air within and to cause further expansion. Under the combined influence of these two conditions a poor tire or one with any weak spots is extremely liable to blow out or burst.

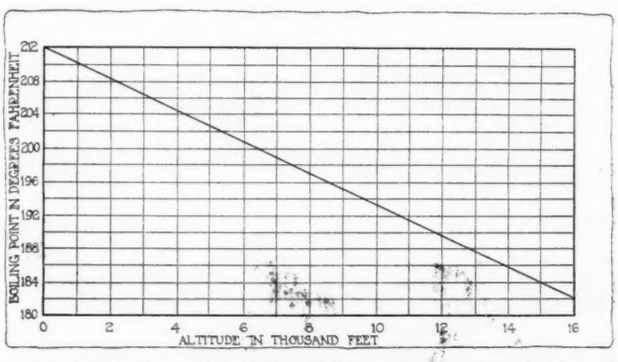


Fig. 1—The boiling point of the cooling water drops gradually and uniformly as the altitude increases

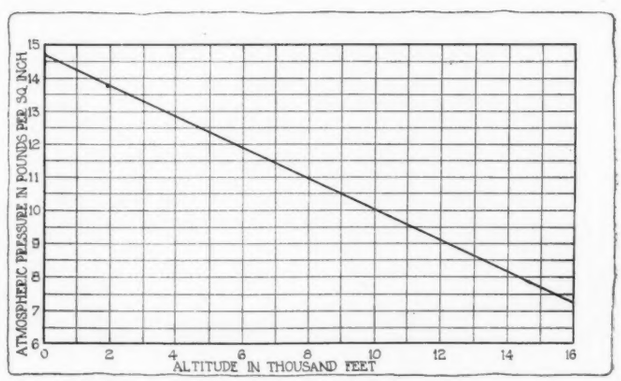
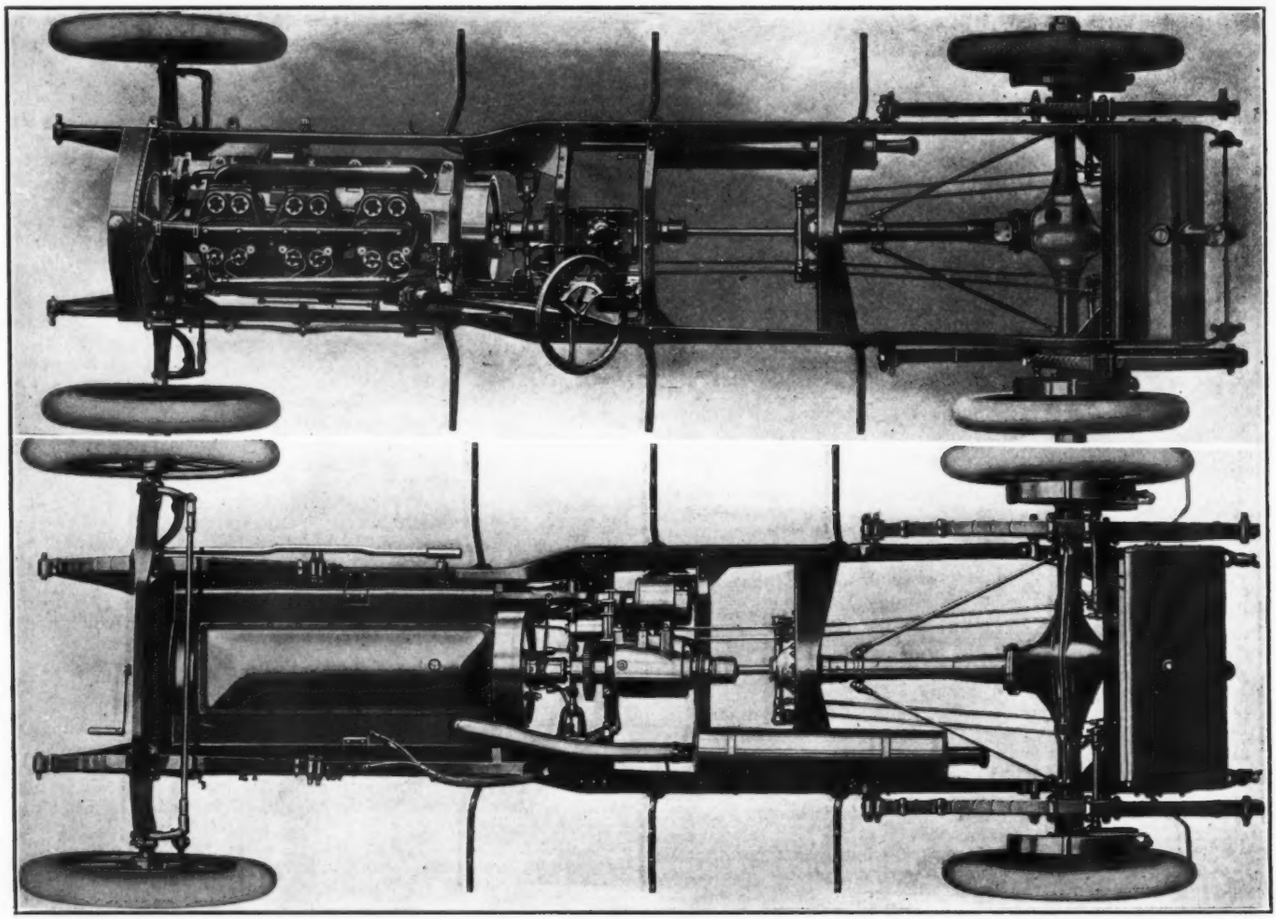
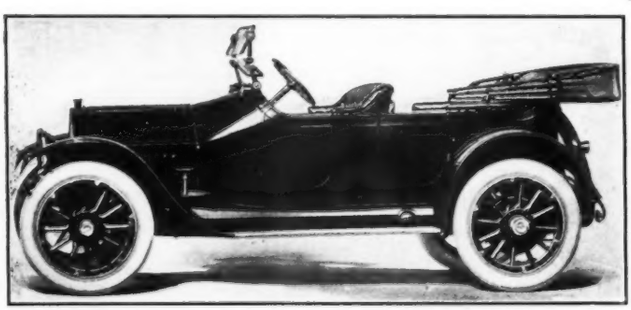


Fig. 2—The atmospheric pressure decreases gradually and uniformly as the altitude increases

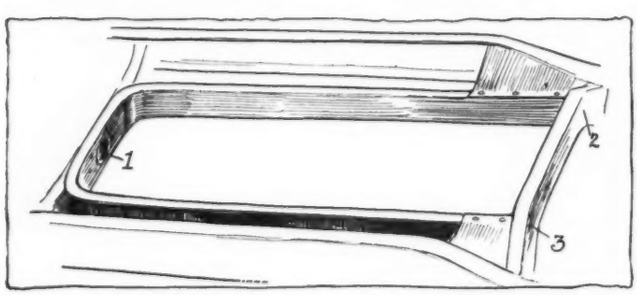


Plan view of the big six-cylinder Mitchell chassis for 1914 and below it bottom view of the same chassis, showing clean design

Mitchell Has Three Models for 1914



Five-passenger, four-cylinder Mitchell touring car for 1914



Three-point support for the motors of 1914 Mitchell cars

THERE have been a number of important improvements in the details of Mitchell cars for 1914, although the distinctive design which characterized the 1913 product of the Mitchell-Lewis Motor Co., Racine, Wis., remains the same. The same three chassis models are retained and continue to be essentially of European engineering practice in the main points of their design, an innovation that was introduced in 1913. Modifications occur in a few minor respects to suit the cars more completely to the demands of the American user and the exigencies of American roads. All have left-side drive with center control.

One Four and Two Sixes

As in the 1913 product, the line will consist of a four-cylinder car, a light six and a big six. The four-cylinder has a 4¼-inch bore and 7-inch stroke, a 120-inch wheelbase and 36 by 4½-inch tires. Upon it are fitted two, four and five-passenger bodies, listed at $1,595. This is an increase in price of $95 as compared with 1913.

The little six has a motor 4¼ by 6 inches cylinder dimensions, although the big six motor, 4¼ by 7 inches, may be installed if desired. The wheelbase is 132 inches and tires and bodies are the same as in the four. The completed car listed at $1,895 with an option of a seven-passenger body at $1,995. As compared with last year's prices the little six is $45 higher.

The big six car with its 4¼ by 7-inch motor, 144-inch wheelbase and 37 by 5-inch tires carries a seven-passenger body only

and is listed at $2,350 a reduction of $150 from the 1913 product.

General features of the chassis are alike throughout the three models except in size and number of cylinders and the wheelbase. The motors are of the same design. All are T-head cast in pairs. All the power plants are carried on a subframe supported at three points. From the motor back the cars are the same except the lengthening of the frame and the greater length of the transmission shaft. The design includes a cone clutch, a very strong frame braced by three exceptionally wide cross-members near its center, a large ball thrust mounting at the front end of the torsion tube, a floating axle and seven-eighths springs.

Commencing with the 1914 motors, both cylinders and crankcase shafting have undergone considerable alteration. The valve chambers are much shallower so that they are closed now by curved instead of by the previous flat stamped-steel covers, which has been found to materially increase the accessibility of push rod adjustments. This in combination with other refinements in the form of the casting, confers the additional advantage of lightening the motor by not less than 200 pounds.

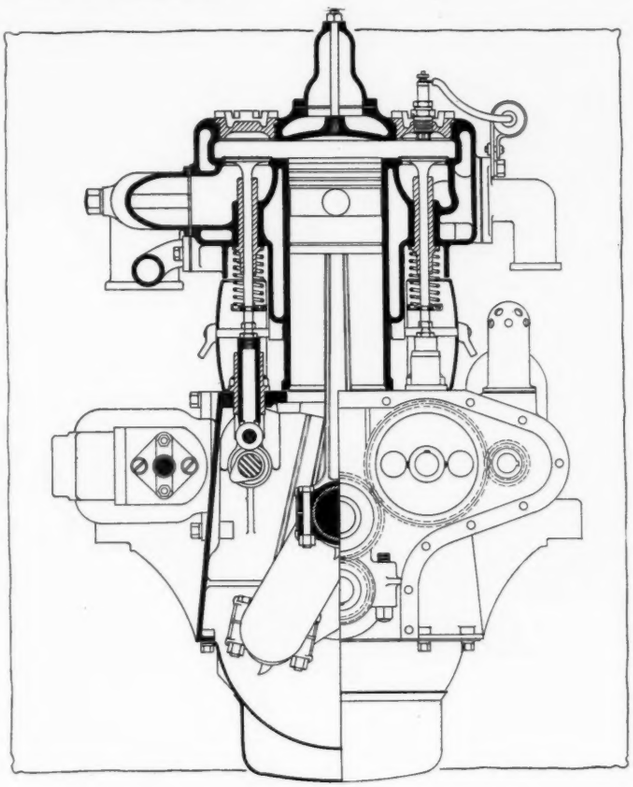
In the crankcase design a special effort has been made to eliminate all dirt-catching pockets and corners by smoothly rounding the parts. The one-piece case is retained with no parting in the crankshaft line. The main bearings are held in webs that partition the interior and contribute to the rigidity, and, to close the bottom, a thin stamped-steel pan suffices, as heretofore.

The motor lubrication involves little more than the combination of a plunger pump in the sump with a pipe and channel to distribute to the crankshaft and other bearings. Oil is led to the timing gears at two points through outside pipes. The oil pump is gear-driven from the camshaft.

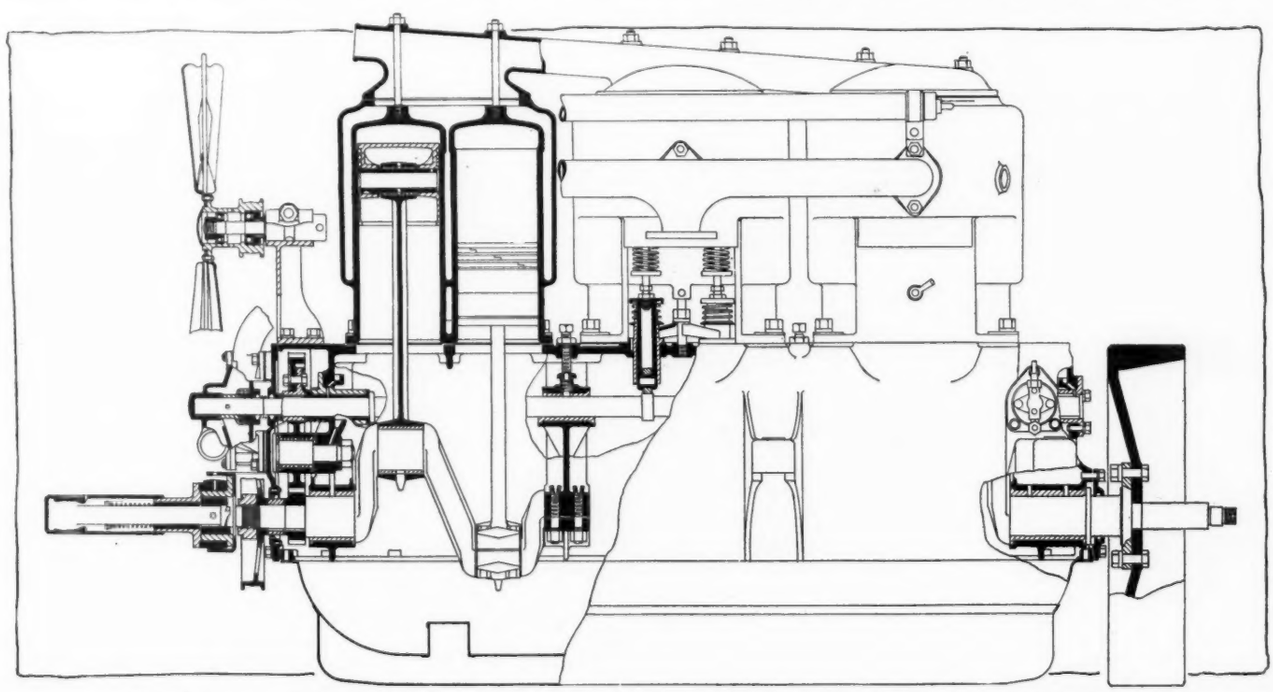
Three-Point Suspension

The six-cylinder motor is now supported by six arms, cast as a part of the crankcase and resting upon a U-shaped channel subframe. At the rear, the U rests at two points on a cross-member of the main frame. The front of the subframe is supported at the center of the front cross-member, in this case a stout forging. There is thus provided a three-point system of support.

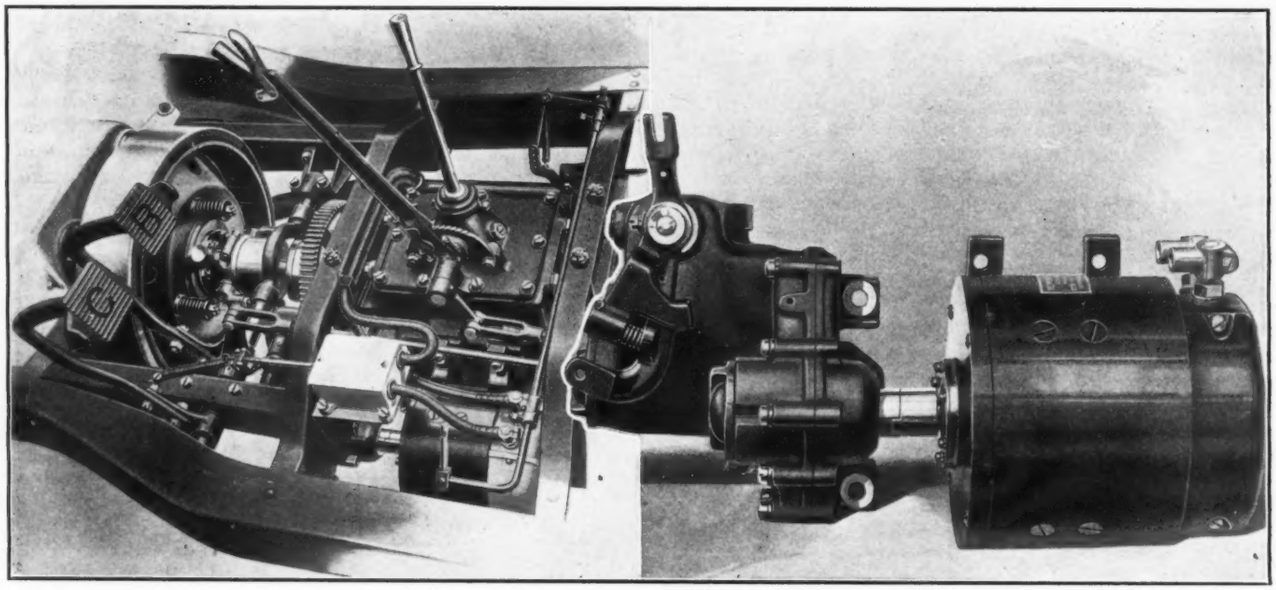
Valves are all interchangeable and measure 2 3-16 inches in diameter with the inlet valve lift 25-64 inch and the exhaust lift 13-32 inch. These lifts with the large valve diameter, over half that of the cylinder bore, afford to the incoming mixture and the outgoing exhaust a freedom of flow that results in the development of considerably more power than might be expected from the cylinder dimensions. Valve springs are exceptionally long and large in diameter so that they do not lose their tension readily. The springs are held in place by cupped-washers and U-shaped retainers instead of with the notched keys used in 1913, the change being made to render them a little more convenient to manipulate.



Partial section through end of Mitchell 1914 motor



Elevation of the Mitchell six-cylinder motor for 1914, showing a part sectional view through the front portion

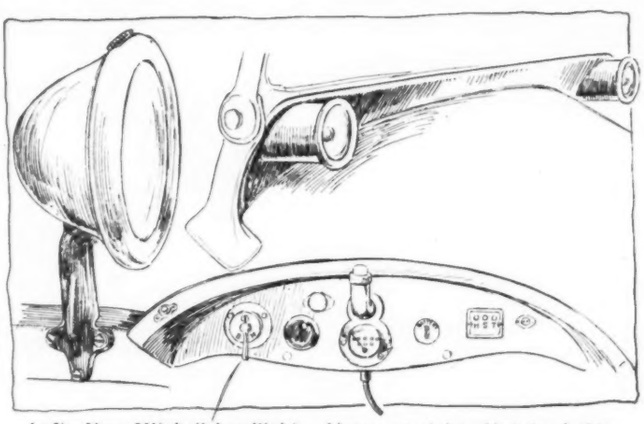


Left—Location of starting elements adjacent to gearbox on 1914 Mitchell cars. Right—Electric starting motor and control assembly

Piston tops are made flat instead of cupped, this change being due to a recent discovery by the engineering department, to the effect that with a deeply-cupped piston, the larger piston area thus exposed to the heat more than offsets the slight advantages accruing from the spherical combustion chamber.

Piston pin diameter has been increased so that the bearing is 1 7-32 inch diameter and 1⅞ inch long. The pin is hollow and thin, making this part of the design consistent with the extreme lightness of the piston. The pin is not fixed endwise in the bosses but is prevented from turning by Woodruff keys and is kept from drifting endwise into the cylinder walls by a brass retainer.

The connecting-rod big end bearings are 2⅜ inches diameter and 2⅛ inches long, the size of the crankshaft bearing with the exception that at the flywheel end, which is 4 inches in length. Drains and felt washers contribute to the oil distribution and to the prevention of oil leakage.



Left—New Mitchell headlight. Above, at right—Sketch of side lamps. Below—Instrument board on cowl

Eccentric Bushings in Timing Case

The timing gear case has been redesigned completely. All the gears, are cut with helical teeth for quietness. Eccentric bushings on the camshaft, electric generator and magneto shafts, provide for wear between the gears. Besides this the idler gear between the crankshaft and camshaft gears is so arranged as to be centered to distribute backlash and so contribute largely to smoothness of running.

The four-bladed fan is now driven by an endless canvas belt with adjustable tension, superseding the gear drive used previously. The belt drive has the claimed advantage of avoiding the need of a slipping clutch and makes for lightness and simplicity.

The Rayfield carbureter used is mounted closer to the manifold, placing it higher and in a more accessible position than heretofore and also reducing gas condensation. Fuel feed is by a combination pressure and gravity system, with the main supply carried at the rear and forced by pressure to a 5-gallon tank in the cowl for gravity feed.

Remy Electric System Used

A Remy high-tension magneto, in combination with a lighting and starting battery as reserve, is used. It is mounted on the left and is driven through a flexible universal from the timing gear case. A fiber distribution tube is employed and all of the secondary wires are marked at both ends with the firing order indicated on a plate on the distribution tube where clearly visible.

For starting the motor on the spark a vibrator is switched into the circuit but at other times the vibrator is not in use and though the battery current ordinarily does not pass through the circuit during the starting, the battery and magneto are momentarily interconnected the direct current being converted into alternating and the two worked in phase through the magneto armature. This arrangement is depended on to afford a starting spark at 30 revolutions per minute.

To furnish the power for cranking a Remy ball-bearing, 6-volt motor of a type that furnishes high starting torque is used. It is located beside the gearbox and drives into a gear on the mainshaft in front of the gearbox. Engagement is effected by pedal working a sliding gear at the same time making the necessary electrical connections.

The starting motor is geared to the crankshaft at 25 to 1 gear ratio. As soon as the engine gets under way a three-wheel clutch allows it to overrun the starting motor so that neither the gears nor the armature can be damaged by overspeeding.

Generator Driven by Timing Gears

The current for keeping the battery charged is supplied from a separate Remy generator mounted on the exhaust side and driven from the timing gears. The starting apparatus is very compact, the cranking motor weighing only 35 pounds.

In connection with the lighting system the Mitchell company is considering plans for the elimination of the side lamps with

the probability that, if the American demand accepts this innovation, headlights for the 1914 models will have double bulbs, the larger for country running and the smaller for city use.

Stamped Clutch Cone

Of transmission changes there are several in the new models. Commencing with the clutch cone, this is now a steel stamping in place of an aluminum casting employed previously. In the gearbox the shafts through the sliding gears are now squared instead of splined. The cross members of the frame which support the gearbox are now curved upwardly instead of downwardly allowing the whole change-speed mechanism to be dropped out of place without removing the body. The gearbox is somewhat smaller than heretofore and the jointless leak-proof construction is retained.

The universals in the driving shaft are splined into place to facilitate easy removal. The massive ball thrust mounting on the front end of the torsion tube is retained but the frame cross-member in which it is carried is deeper and more heavily webbed.

The rear axle construction has been modified considerably in the respects to lightness, simplicity and accessibility. The differential can now be inspected through a large, cast aluminum cover and the drive to the wheels is of the floating type, the wheels riding on the axle housing and being driven by jaw clutches. Taper roller bearings are used in the rear wheels and the floating drive shafts are removable through the wheel hubs. The bevel pinion is adjustable through a small opening in the rear end of the torsion shaft, which closes by a plate.

The brake rods now pass over instead of under the axle and attach to arms on rocker shafts parallel with the axle and of sufficient length so that the brake rods do not have to spread as close to the wheels as heretofore. The brakes are internal and external, the latter being the foot brake.

Steering Unchanged

The steering mechanism is the same as has been used in Mitchell cars for the past 6 years the only change being that it is now mounted on the subframe. The front axle is not dropped as much as formerly so that the road clearance has been increased to 12 inches, 2 inches more than in 1913.

Springs have been lengthened considerably. The semi-elliptic fronts measure 40 inches by 2 inches wide. They are secured with castellated nuts cotter-pinned. The seven-eighths rear springs have main members 54 inches by 2 inches wide. The idea in using this type of spring is to get practically the same cushioning effect as with the elliptic but without involving distance rods.

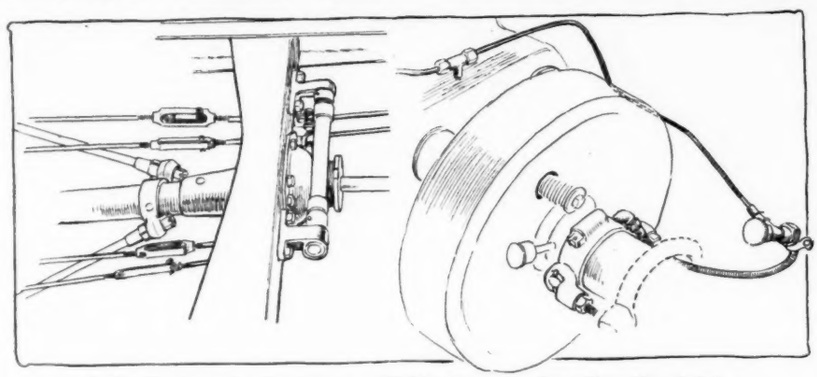
Bodies are a development of the attractive streamline forms of 1913. They incorporate a very deep cowl and deep curves in the upper edge of the doors. Other line refinements are obtained by the rounded back and smoother curves of the fenders.

Octopus-Eye Dash Lamps

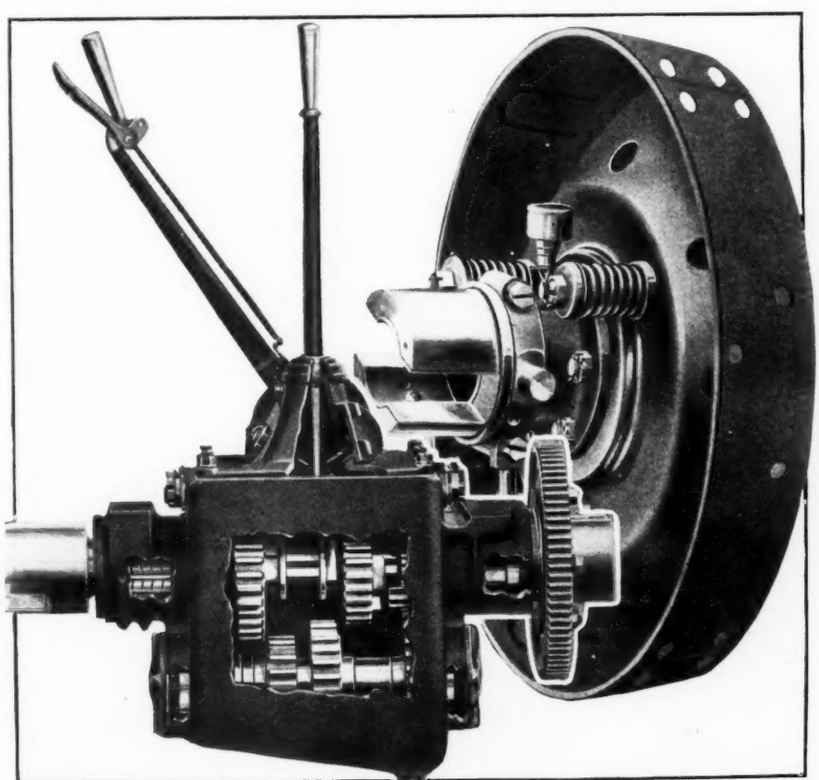
Where dash lamps are employed the octopus-eye type is set in the windshield baseboard. The headlights are mounted upon a very heavy single pedestal and have the wiring carried through the frame horn and up through the pedestal. All of the electric wiring is carried in conduits.

Even the apron has a streamline effect obtained by the long sweep of the lines of the joints by which it is connected to body and fender. This is a detail which brings out the prevailing tendency towards more thoroughness and consistency in the application to the automobile of lines that are pleasing to the eye.

The roadsters have a long sloping rear deck with exceptionally ample storage space.



Left—Brake rod adjustments. Right—Provision for oiling the clutch



Left—Gearbox and control levers on 1914 Mitchell. Right—Leather-faced cone clutch, showing adjustable springs

LBA Battery Used

The 120-ampere hour LBA battery is carried on the running board. Tire irons are carried at the rear with one extra demountable rim and an option of double irons is offered. The instruments are carried on a cowl board and there is a carbureter adjustment on the steering post and a gasoline primer to the intake manifold, operated by a small dash pump. A feature of the equipment is the exploring lamp carried in a socket under the cowl where it is readily accessible when wanted for quick inspection purposes.

The seven-passenger bodies have folding auxiliary seats.

Says Test Shows Big Power Loss

Acetylene Man Claims That Power Consumed by Generator Is Heavy Part of Small Motor Output

INDIANAPOLIS, IND.—Editor THE AUTOMOBILE:—At the conclusion of the Indianapolis Motor Speedway tests last summer I made the statement that the generation of electricity by an automobile motor involved a power loss of from 5 to 12 per cent., depending upon the horsepower of the motor.

For this statement I have been very liberally "roasted" in your columns by Mr. Kebler, Mr. Rushmore, Mr. Bailey and others of the electric lighting and starting fraternity, most of whom claimed that the power loss would be only a fraction of 1 per cent.

I now want to call your attention to the Packard test recently conducted on the Long Island Speedway, which shows that at a speed of 20 miles per hour the power loss was 5.2 per cent.

You will also note that in the Packard test the power loss of 3.3 per cent. recorded was at a speed of 40 miles per hour. Practically, this may be disregarded, for the reason that a speed of 40 miles per hour in daily service is unusual.

Burden Is Greater for Small Engine

Since the amount of power required to operate the generator remains the same whether the engine be large or small, it becomes evident that the burden of operating the generator is far greater proportionately in a small engine than in a large engine. The Packard motor has six cylinders and is rated at 38.5 horsepower, A. L. A. M. In the Indianapolis speedway tests a motor of 32.4 horsepower, A. L. A. M., operating at the same speed, 20 miles per hour, showed a power loss of 6.9 per cent.

Taking into consideration that the Packard test was made on a straightaway, whereas our tests involved the curves of the Indianapolis Motor Speedway, and further considering the fact that in our tests the start in each instance was made on the measured gallon of fuel, whereas in the Packard test the starting was made on a reserve supply of fuel, I think the approximate accuracy of the Indianapolis speedway tests is confirmed in all respects by the Packard test. Indeed, the speedway tests would seem to be of more practical value as applied to the conditions of daily driving which involve starting and stopping, turning corners, etc.

It is probably true that the buyer of a Packard is not greatly concerned by the loss of 5 per cent. or even a greater percentage of fuel. But isn't the buyer of a medium-priced, moderate-powered car, who is bound to suffer a much larger proportion of loss than 5 per cent., entitled to know it? I think he is.

If the gentlemen who attacked the Indianapolis Motor Speedway tests so promptly and so vigorously in your columns will now proceed to "pooh-pooh" the Packard test in the same fashion, I assume that you will be willing to accord them the necessary space, and I am certain that your readers, as well as the undersigned, will be greatly edified.—R. H. COOMBS.

Thinks Automobile Electric System Is Miniature of Railroad Car's

CHICAGO, ILL.—Editor THE AUTOMOBILE:—In THE AUTOMOBILE for November 13, R. H. Coombs answers mine of October 9, agreeing with me in regard to the similarity of principle of railroad car lighting and automobile lighting, but he says that, while both use a dynamo with accumulator, the similarity stops right there. Let us see how correct Mr. Coombs is in his latter statement:

Automobile Lighting-Starting		Railroad Car Lighting
Miles per hour, ability	0—100	0—90
Ability to operate equally well either direction rotation	No (because automobile engine only rotates in one direction)	Yes (because car truck can run in two directions)
Wide variation lamp load	Yes	Yes
Accuracy dynamo regulation required	Yes	Yes
Lamp voltage control required	Yes	Yes
Dynamo mounting	On motor	On car truck
Dynamo drive	Gear or belt	Belt
Regulator mounting	On body	On body
Battery location	Under body	Under body
Total weight equipment, including batteries	150 pounds	3,300 pounds
Wattage capacity	75	1,500

Let us look at the question from another point of view and compare a bill of material for either kind of lighting.

Material Required Light Automobile	Material Required Light One Railroad Car
Dynamo	Dynamo with pole changer
Regulator for dynamo and lamp voltage	Regulator for dynamo and lamp voltage
Set batteries	Set batteries
Set lamps	Set lamps
Set wiring	Set wiring
Battery container	Battery container

The above shows that there is similarity of the two systems all the way through, with the very small exception that the automobile dynamo is fortunate in not requiring the item of a mechanical pole changer tied to it.

Answering the next to the last paragraph of Mr. Coombs' communication, it will be noted from above comparisons that a set of train lighting appartatus weights about twenty times the weight of a set of automobile lighting apparatus, but it will also be noticed that the wattage of a train lighting set is twenty times that of the automobile lighting set. The wattage and weight of the two systems being the same ratio neither system has any advantage over the other in operation, and therefore a good automobile lighting system is a miniature of a good train lighting system.

Little Attention Given Battery by Railroads

Mr. Coombs, in saying that the train lighting system has a surplus of attention, is not aware of the real situation. It is only a usual thing for a good train lighting to operate 60 or 70,000 miles without any attention beyond greasing the dynamo and renewal of belts, a year being expected of the battery without serious attention. Railroad companies cannot afford to give any device a surplus of attention, at least, not until the Interstate Commerce Commission allows them to raise their freight rates. An ordinary railroad coach averages 300 miles every 24 hours for a year and then goes to the shops for general overhauling, and it is their aim to have all its equipment operate between these overhaulings with minimum attention. How many automobiles could make half this mileage without

complete overhauling? And yet any automobile owner will be satisfied if his lighting-starting device operates sucessfully between annual car overhaulings periods.

In a previous communication Mr. Coombs speaks of the additional weight of automobiles due to the adding of lighting-starting outfits. This apparatus only equals the weight of an average man, and would not any of us in the old days be only too glad to carry a man around all the time solely for the purpose of cranking the engine, trimming and lighting the lamps, and getting out and adjusting gas pressure from the acetylene tank every 20 miles or so, provided we did not have to pay him wages? We cannot get something for nothing, and therefore the question is to get the most efficient apparatus to do the work required.

Lamp Voltage Control Is Important

You will note that the item Lamp Voltage Control is required in both automobile and train lighting apparatus. This is just as important in automobile lighting as in train lighting, and yet it seems to have been completely overlooked in most apparatus built for automobile lighting.

Accuracy of dynamobile regulation throughout range of car speed is equally important and yet overlooked, and all of this I attribute to the fact that the sudden demand from the public for lighting-starting caused a flood of half-baked apparatus to be offered, and this temporary situation gives Mr. Coombs good opportunity to throw the harpoon, but it is perfectly possible right now to purchase highly perfected starting-lighting apparatus that only draws from the gasoline tank sufficient fuel to do the work of keeping the battery charged without overcharging and preserve such normal voltage on the lamps that satisfactory lamp life is obtained.—R. M. Newbold.

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Takes Exception to German Author's Views of Starter Weights and Capacities

Sandy Hook, Conn.—Editor The Automobile:—On page 1069 of The Automobile for December 4 is published an article entitled Estimated Working Capacity and Weights of Starters Operated by Compressed Air Shot Into Cylinders which is an extract from *Automobil-Rundschau*, October 15. This article seems to have been written by someone unfamiliar with modern air starting.

First, the statement is made that a tank pressure of 450 pounds is carried and we are not surprised when it is admitted later on that difficulty is experienced in holding this pressure in the face of motor car vibration. Further, we find that this is particularly troublesome on vehicles not running on rubber tires and we would ask in all fairness whether this archaic condition does not alone stamp the author as too unpractically experienced to propound opinions before the public. Our own particular system pumps up to only 300 pounds and is not operative again until the pressure has dropped to 240 and we see no reason to use a higher one as with a tank readily installable on any chassis this will spin a motor considerably over 200 to 250 revolutions depending on the oil viscosity and piston fit.

Regarding the time that an air starting equipment will turn a motor over from the average tank it is impossible to either calculate or estimate and a comparison with the electric starter along this line is neither comprehensive nor fair because the air system is of so much higher speed that it is not a question of time to get a start. With cranking speeds of 250 and over the gasoline is torn apart and carried bodily up into the motor, and invariably actually wets the plug electrodes. Under these conditions the start is immediate irrespective of the temperature and useless calculations lead nowhere. Not much over 20 or 25 revolutions at these speeds will load the cylinders and the manifold heavier than priming but with added advantage that the plugs are wetted and the start does not depend on vaporization but upon actually setting fire to a fluid. To avoid an extravagant waste of air and to realize all the displacement of the tank, we have developed what we call an "expansion distributer." This valve lets the motor have full pressure all the way down the stroke for the first or starting stroke only and then automatically runs on a cut off or expansion which becomes earlier as the speed increases. In other words, at 50 revolutions the high pressure air is cut off at one-half stroke, and the piston is thereafter driven down by expansion; at 100 revolutions the cut-off has occurred at 1-3 stroke and so on as the speed goes up.

The theoretically deduced weights are also very far off and must not be allowed to pass. Our whole machine which embodies the starting equipment and electric lighting generator in a unit casing driven from only one shaft end at engine speed weighs exactly 45 pounds.—C. S. Cole, Chief Engineer, Electrical Engineering & Storage Battery Co.

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Car Registrations Gain 71,884 in 3 Months

(*Continued from page* 1091.)

and to sectional registration and to estimates furnished by local authorities. The figures under the other headings are estimated in the same manner as the total registration figures for the three states mentioned.

Dealers Have Greatly Increased

As may be seen from the tables on page 1090, the number of dealers, garages, repair shops and supply houses in the United States is now 20,594, an increase of 2,047 over the figures at the close of 1912, while the manufacturers of automobiles, trucks and motors have decreased from 604 to 569, this decrease representing the weeding-out and settling-down process which has been gradually going on in the industry.

The United States continues to hold first place among the nations of the world as an exporter of automobiles and parts, although the automobile exports of France exceed those of the United States in value at the present time. However, if the rate of increase in the number of cars shipped abroad continues to hold good, it will not be long before America will lead in the value of cars exported as well as in respect to number.

For the first time, The Automobile has requested the registration officials to give the number of chauffeurs, or operators of motor vehicles licensed in each state. Although these figures are not complete, as all the states do not require registrations of operators, there are at the present time over 238,505 chauffeurs licensed in the United States. It is probable that, if the figures for states not requiring registration of chauffeurs were included, the total would exceed 300,000.

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Two Buicks Win New York 500-Mile Reliability

(*Continued from page* 1095.)

At the close of the run favorable comments were heard on every hand and many of the participants stated that they would have cars in the next contest of this nature. The lesson learned from the results was a valuable one and showed that the entrants gained a valuable insight into the performance of their cars and equipment. It is freely predicted that the next contest will see a longer list of entries. The entries in this event and their specifications are as follows:

TABLE OF ENTRIES

No.	Car	Model	Cylinders	Bore, Inches	Stroke, Inches	Body Passengers
1.	Buick	25-B 1914	4	3.75	3.75	5
2.	Buick	25-B 1914	4	3.75	3.75	5
3.	Buick	24 1914	4	3.75	3.75	2
4.	Buick	36 1914	4	3.75	5	2
5.	Chandler	1914	6	3.375	5	5
6.	Oakland	48 1914	6	3.5	5	5
7.	Oldsmobile	54 1914	6	4.25	5.25	5
8.	De Dion	1909	8	3.54	4.72	4
9.	National	40 1914	4	4.875	6	5
10.	Hudson	54 1914	6	4.125	5.25	5
11.	Buick	55-B 1914	6	3.75	5	5

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The Actual Horizon

WITH the city of Detroit manufacturing more automobiles during the past month and at the present than it was making a year ago the dismal business atmosphere that several dealers in New York, in Chicago, in Boston and in Philadelphia would like to create is hardly in harmony. Dealers in these large centers are in any atmosphere that responds very readily to Wall street operations and when there is a stringency in this money circle it is immediately made known to the automobile dealers, as one class of merchandisers doing business with these financial interests.

From other parts of the land optimistic reports are reaching the factories every week and have been reaching the factories every week for a month or so and it is the business coming from such places that is keeping the automobile factories in Detroit and in other cities working to capacity and in not a few cases working overtime in order to actually keep up with requirements.

One large Detroit maker, who has been listening to the clamoring of Wall street with one ear and lending the other to the favorable reports from the great middle west, the west, and many of the central and eastern states took a canvas of the number of workmen in the Detroit factories to learn how many had been laid off during the past few months. The result was amazing to him. He found all factories practically up to force, but met with some wise examples of cutting down useless overhead and other needless forces of men that were below par in the scale of economic productiveness.

Removing the Kinks

YEARS ago automobiles were full of kinks, little weaknesses that had to be corrected, and the makers were ready to enter competitions in which these weaknesses or errors in design or construction, call them which you will, were brought to their attention. In those days were taught the lessons of brake capacity, of necessary tensile strength of axles, adequate strain-resisting qualities of wheels, strength factor in springs, as well as a good score of other features. The contests brought the makers face to face with their weaknesses, and not a few were able to correct these errors before the product of a season had been distributed to the four corners of the land. The result was good economics, it being cheaper to correct errors in an early model than to make replacements on hundreds and thousands of cars sold in all the states of the union. The lessons learned in the contest were a little severe; often the publicity at the moment had a painful sting, but in the end it was a cheap lesson and one that brought quick results.

Those days passed. The maker tired of contests, tired, apparently, of the lessons they had to teach him. He knew how strong springs should be, he had finally learned the required strength of axles, frames no longer broke, gearsets gave satisfaction, and magneto, carburetor and a dozen other parts bore evidence of the improvement that had been accomplished.

Today the maker still refuses to compete in contests, even contests that have been brought up to date, and which include within their scope the latest developments of the automobile. But a contest of this nature in New York and vicinity last week demonstrated that there are still parts of the car that have to be given attention, and that there are still makers who are continuing to market cars with slight defects, which should be corrected and which would be corrected if these cars were entered in more of such contests. The New York run demonstrated that there are some details of self-starters that are not yet in the final stages of perfection. There are features of design in connection with motors and other car parts that are defective, and while some makers have known of these defects they have not taken the trouble to correct them. It is to be hoped that these contests, as similar ones did in the past, will make it imperative that the manufacturer set about immediately to correct existing abuses. He should not wait for another year until he brings out a new model but do the work at once. There are some makers who announce their opposition to annual models and yet it is amazing how they do put off the making of small improvements and make a regular house-cleaning job at the end of the fiscal year, and in spite of their own determination, bring out an additional model in which all of the minor alterations have been made.

If reliability contests do nothing else they impress on makers the necessity of making early amends for errors in design or construction. These faults are laid bare to the public and the maker must make good. Perhaps this is better than allowing these defects to continue and a year later discovering that every owner has been telling his defects to his neighbor, and so forces, working against the car, have been silently growing for months and months without the maker being aware of them.

The Blue Sky

DETROIT, MICH., Dec. 6—Detroit is manufacturing more automobiles this week than it did in the corresponding week a year ago, and this notwithstanding the rumors that so many gossips moving in and out among the industry would try to set afloat. Ford is turning out over 700 cars per day, which is in excess of the production at this plant a year ago. For 1914 Cadillac increased its output from 15,000 to 18,000 and, in addition to keeping up with its schedule of delivery, the company had built on December 1, 2,880 of these additional 3,000 machines, so that the company is well ahead in its year's work.

Maxwell Working Overtime

The Maxwell company is working overtime, building fifty cars a day and expecting to increase this to seventy-five in a month. At the Studebaker plants the overtime program is in actual operation. The enormous Buick plant is working at full force to fill orders: The Chalmers company is working up to factory capacity, Hudson is pushing its little six production at a full-capacity pace. Paige-Detroit will move into its new factory in 30 days where it will have facilities to double its 1913 output.

From all of the other Detroit automobile factories come equally optimistic reports. Lozier is working overtime on its new four; needless to say Packard is at capacity on its new models; Hup is busy; in Pontiac the Oakland and Cartercar factories are busy; the plant of the Detroit electric, one of the biggest in the electric field, is at capacity production. The Briggs-Detroiter is at schedule and the Keeton plant is busy. Look where you will, all is activity in Detroit's automobile plants at the present, and, from all indications, this healthy activity is a normal condition.

Factory representatives who have been out through their territories during the past few months report a big demand for cars and if business is a little slack in three or four cities dominated by Wall Street it is a certainty that this influence is not even felt through the broad acres of the land. An advertising representative of a leading factory recently visited Kansas with the object of discovering the real conditions in that state and although expecting to find money scarce and sales few actually discovered that the Kansas dealers were wanting cars. As one dealer expressed it: "Kansas is not in need of any sympathy, we have had a good wheat crop and more silos are being built to care for the corn stocks than ever before."

Big Business in Buffalo

A Buffalo dealer in this city a few days ago summed up the situation in the Bison City as follows: "We have just closed up a very prosperous year, in fact, our business has mounted to more than a quarter of a million in the last year, including 200 pleasure cars and forty-five light delivery wagons, and could have sold more if we could have had them. More than that we sold 182 customers on notes and deferred payments, every one of which, without failure or discount, has been cleaned up, and now we are looking for the real cause of this story of hard times. It has not yet reached Buffalo."

Big Sales of Cars in Australia

SYDNEY, AUSTRALIA, October 28—There are rattling good seasons throughout the whole of Australia and business is good everywhere. Agents of Ford, Buick, Overland, Hupmobile and Oakland are selling as many cars as they can possibly get from the factories. Cars of this make are to be seen throughout Australia in the largest numbers. You can better appreciate this when you know that the large cities are now the poorest buyers, recent statistics from the various registration centers of the country showing that 70 per cent. of the cars sold go into what is known as the back country. Throughout Australia this back country, to a very large extent, consists of dirt roads, only the main highways being macadam. Once off the main highways, you have to travel over everything and the light car is ideal for this work.

In a recent contest conducted by the Automobile Club of Australia the light cars came out on top because the competitors were unfortunate enough to travel over soft dirt roads immediately following 2 days of rain. The heavy cars were almost helpless in such conditions. A 10-horsepower Benz won.

American manufacturers should turn more attention to exporting their cars to Australia, and those companies that are making larger cars will find their business dropping off on this continent. The small cars of the European market, particularly those from France and Germany, are gaining ground in Australia at the expense of the American car today. Not only is this true throughout all Australia but also New Zealand. The British light car is doing well, but the spotlight at present is on the French and the German. Even among many Americans now resident in Australia the European car is preferred to the American product.

The registration report for New South Wales shows 637 motor cars registered between July 1 and September 30, 1913, and 655 motorcycles. In this one region the total cars in use September 30 were 7,208. Judging from these figures which represent business in the wet winter months it is conservative to estimate that New South Wales alone will absorb 3,000 cars for 1914. Victoria can absorb a similar number, and South Australia, Queensland, and West Australia will each absorb probably one-third as many.

Wilcox Increases Capital

MINNEAPOLIS, MINN., Dec. 9—The H. E. Wilcox M. C. Co. has reorganized and increased its authorized capital from $1,000,000 to $3,500,000. The reason is an increased demand for the trucks, which makes necessary more machinery and some enlargement of the plant. O. P. Briggs, former head of the Twin City Iron Works, and for 7 years president of the National Founders' Association, is president. Directors are M. J. Scanlon; F. E. Kenaston, C. H. Davidson, Jr., G. W. Lewis and P. M. Starnes. The three members of the Wilcox company retain their interest, John F., Harry E. and R. D. Wilcox. H. E. Wilcox is vice-president. Between 600 and 700 men are employed in the busy season, and this is to be increased to 1,500. Three standard types of Wilcox trucks are made and others are being added.

Moon Makes Record Shipment

ST. LOUIS, MO., Dec. 9—The Moon M. C. Co., of St. Louis, this week announces its largest shipment. According to Stewart McDonald, vice-president of the company, five carloads of Moon light six streamlines were shipped. One car was consigned to each the Taylor, Tex. branch and the branch at Canyon City, Col. The Minneapolis agency received three loads of the machines.

St. Louis Men Take Over Wahl Company

C. A. Root Is President—Understood Consideration $100,000—Price on Car Increased to $890

ST. LOUIS, MO., Dec. 9—St. Louis automobile men have taken over and reorganized the Wahl Automobile Co., of Detroit, which recently went into the hands of its creditors. The M. W. Bond Automobile Company, of St. Louis, will be the chief distributor of the Wahl car. This fall when the firm was taken over by the creditors, G. A. Root, head of the wholesale department of the Bond company, organized a local stock company to buy the rights and plant of the company at Detroit.

It is understood that $100,000 was the consideration involved.

The new officers of the Wahl company are: George A. Root, president and salesmanager; Joseph Nulsen, vice-president and A. G. Nulsen, Jr., secretary and treasurer. The price on the car which originally sold for $790 and $750 has been increased to $890 and $850 for the touring car and the roadster respectively.

Grossman Takes Mosler Plug License

NEW YORK CITY, Dec. 9—The Emil Grossman Mfg. Co., of Brooklyn, N. Y. has taken out a license under the Canfield patent No. 612,701. He has also taken out licenses under patents Nos. 642,167 and 915,896, for priming plugs issued to F. R. Sims, London, Eng., and J. G. Shea, Detroit, respectively. The Red Head priming plugs manufactured by him are now under the protection of these patents.

With the exception of Mr. Mosler, himself, and the Champion Ignition Co., Flint, Mich., which took out licenses 3 years ago for that patent, the following concerns have been granted licenses from A. R. Mosler & Co., which owns the patent: Auburn Ignition Co., Auburn, N. Y., Silvex Co., New York City, Jeffery-DeWitt Co., Detroit, Mich., Champion Spark Plug Co. Toledo, O., G. A. Mezger, Inc., New York City, Rajah Auto Supply Co., Bloomfield, N. J., Hartford Machine Screw Co., Hartford, Conn.; Benford Mfg. Co., Mt. Vernon, N. Y.; Frontier Specialty Co., Buffalo, N. Y.; the New York Mica & Mfg. Co., Auburn, N. Y., and the Emil Grossman Mfg. Co.

Johns-Manville Takes Over Arnold Vaporizer

NEW YORK CITY, Dec. 10—The Johns-Manville Co. has added still another accessory to its list. Following the announcement of the Long horn acquisition comes the word that the Arnold electric vaporizer and heating plugs, manufactured by the Arnold Electric Co., will hereafter be sold under the supervision of this company. The vaporizer consists of a drum in which a series of resistance coils are mounted. By closing the switch the current passes through the coils, generating a high degree of heat in a short space of time. As the motor is turned over, this heated air is drawn over the spraying coils in the carbureter, causing the gasoline to vaporize. For such cars as the Ford, Overland, etc., the heating plugs are used. They are installed in the intake manifold and heat the vapor instead of the air.

The company also states that it has reduced the retail price of J-S model of the Long horn to $10. The horn is made in three models: model S is 9.5 inches long; model J-S is 7.5 inches long and the J-M for motor-cycles is 4.5 inches long. A special Ford model will be announced at an early date.

Determines Official Freight Classification

NEW YORK CITY, Dec. 10—A report from J. S. Marvin, general traffic manager of the general traffic department, states that the official classification on minimum weight on automobile carloads, when carriers furnish cars longer than order by the shipper, makes the minimum carload weight on automobiles 10,000 pounds for 36-foot cars and for 40-foot cars, 11,200 pounds. The minimum, though, on 40-foot cars may be 10,000 pounds if the cars of this length are furnished by the carriers to fill the shippers' orders for 36-foot cars. In other words, if an automobile shipper orders a 36-foot car and the carrier is unable to furnish a car of that length but furnishes instead a 40-foot car, the minimum weight on the latter car is 10,000 pounds.

But if the carrier is unable to furnish either a 36 or 40-foot car and then furnishes a longer car, the minimum is 10,000 pounds, except that in this case the carrier is allowed 6 days within which to furnish either a 36 or 40-foot car.

If the original order is for a 40-foot car and the carrier within 6 days is unable to furnish same and after that period furnishes instead a 50-foot car, the minimum will be 11,200 pounds. This rule would apply only when the shipment could actually be loaded into a car of length ordered and would not apply if the loading capacity of the longer cars were used, in which event the minimum would be 11,200 pounds on 40-foot cars and 16,200 pounds on 50-foot cars. When 40-foot cars are furnished by carriers and used by the shippers in this way the automobile owner is requested to make the following notation on the bill of lading:

Car —— ft. in length order by shipper on.....(date)
Car —— ft. in length furnished by carrier on.....(date)
under rule 27, official classification.

If the shipper orders a 40-foot car and the carrier within 6 days is unable to furnish either a 40-foot or 50-foot car and after that period furnishes two shorter cars instead, the longer of the two cars furnished shall be charged at the regular minimum weight fixed for a car of that length and the remainder of the shipment loaded in the other car shall be charged at actual weight and the carload rate, except that the total weight charged for the two cars would not be less than 11,200 pounds.

If the original order is for a 50-foot car and the carrier within 6 days is unable to furnish the same and after that period furnishes instead two shorter cars, charges will be in accordance with the previous paragraph, except that the total weight charged for would not be less than 16,200 pounds.

NEW YORK CITY, Dec. 9—The U. S. Tire Co. has come down on its plain tread tire prices so as to meet the reductions of the other tire concerns.

NEW YORK CITY, Dec. 9—Edward A. C. Cassidy has become sales manager of the automobile accessories department of the H. W. Johns-Manville Co.

Automobile Securities Quotations

No changes of any importance occurred in this week automobile securities quotations.

	1912		1913	
	Bid	Asked	Bid	Asked
Ajax-Grieb Rubber Co., com	180	190	200	205
Ajax-Grieb Rubber Co., pfd	98	99	97	102
Aluminum Castings, pfd	98	100	98	100
Chalmers Motor Co., com	..	..	90	94
Chalmers Motor Co., pfd	..	..	..	96
Consolidated Rubber Tire Co., com	11	14	31	35
Consolidated Rubber Tire Co., pfd	50	60	95	100
Firestone Tire & Rubber Co., com	295	305	235	245
Firestone Tire & Rubber Co., pfd	105	107	100	101½
Garford Co., pfd	100	102	85	90
General Motors Co., com	33	34	35	36
General Motors Co., pfd	76	77½	74	76
B. F. Goodrich Co., com	63	64	16	17
B. F. Goodrich Co., pfd	105	106	78¼	78½
Goodyear Tire & Rubber Co., com	..	425	200	210
Goodyear Tire & Rubber Co., pfd	105	106	92½	93½
Gray & Davis Co., p.d	..	..	96	102
Hayes Manufacturing Co	..	90	..	..
International Motor Co., com	..	18	..	5
International Motor Co., pfd	..	65	..	15
Kelly-Springfield Motor Truck Co., com	..	..	50	60
Kelly-Springfield Motor Truck Co., pfd	..	..	90	101
Lozier Motor Co., com	..	..	..	16
Lozier Motor Co., pfd	..	..	..	90
Maxwell Motor Co., com	..	..	2½	3
Maxwell Motor Co., 1st pfd	..	..	19	20
Maxwell Motor Co., 2d pfd	..	..	6¼	7
Miller Rubber Co	148	153	120	130
New Departure Mfg. Co., com	..	..	140	160
New Departure Mfg. Co., pfd	..	..	100	102
Packard Motor Co., pfd	105	106	90	95
Palmer & Singer, p.d	..	..	..	65
Peerless Motor Co., com	..	..	15	25
Peerless Motor Co., pfd	..	..	75	85
Pope Manufacturing Co., com	27	28	1	3
Pope Manufacturing Co., pfd	68	70	10	14
Portage Rubber Co., com	..	..	..	30
Portage Rubber Co., pfd	..	..	..	90
Reo Motor Truck Co	9	9½	5	6
Reo Motor Car Co	19½	20½	13¾	15
Rubber Goods Mfg. Co., pfd	105½	106½	105	115
Russell Motor Car Co., com	..	..	..	40
Russell Motor Car Co., pfd	..	..	..	70
Splitdorf Electric Co., pfd	..	..	40	45
Stewart-Warner Speedometer Co., com	..	..	55	61
Stewart-Warner Speedometer Co., pfd	..	..	96	97½
Studebaker Co., com	38½	39¼	16	17
Studebaker Co., p.d	91	92½	64¾	68
Swinehart Tire Co	99½	100½	70	76
U. S. Motor Co., com	..	..	54½	55½
U. S. Rubber Co., 1st pfd	..	..	99	99¼
Vacuum Oil Co	..	..	192	195
White Company, pfd	105	108	105	110
Willys-Overland Co., com	69	70	58	62
Willys-Overland Co., pfd	100	100½	81	83

Goodyear Net Profits for Year $2,041,000

Company Does Gross Business Amounting to $32,500,000—An Increase of Over $7,000,000

NEW YORK CITY, Dec. 5—The detailed statement given out by president F. A. Seiberling, of the Goodyear Tire & Rubber Co., at the annual stockholders' meeting shows some interesting facts relative to the earnings and the magnitude of the business done by this one company.

The company did a gross business amounting to $32,500,000 for the year ending November 1, an increase of over $7,000,000. The net profits were $2,041,000, equal to 33 per cent. on the common stock. This compares with 50 per cent. earned on the common stock last year.

The report of the auditors makes the following comment:

Plant—To meet the demand for increased production of the various commodities, large additions have been made during the year at a cost of $2,495,680. The reserve for depreciation, amounting to $858,909, is equivalent to 22.3 per cent. of the plant value of $3,855,569 as to October 31, 1912.

Patents, trade marks and designs—Though this asset is stated at the nominal value of $1, that it has substantial value may be inferred from the company's expanding business, and from the granting to other companies of certain rights under the patents, which royalties during the period under review amounted to $69,987.

The company has outstanding $5,000,000 preferred and $5,026,700 common. The balance sheet as of October 31, 1913, shows a reserve for accounts and depreciation of $1,367,391, and a surplus of $2,820,071.

November, the first month of the fiscal year 1914, showed a gain in sales of 25 per cent. over November a year ago.

Bosch Sues F. A. Baker Co.

NEW YORK CITY, Dec. 10—The expected suits against the Hendee Mfg. Co., and the Splitdorf Electrical Co. for alleged infringements of the Bosch patent, No. 974,967, took an unexpected course last week. Instead of filing suit against the manufacturers, the Bosch company filed a bill of complaint against the F. A. Baker Co., distributor of Indian motorcycles in New York and vicinity. The Baker company is alleged to have sold a large number of Indian motorcycles upon which were fitted Splitdorf magnetos, which are claimed to be direct infringements of the Bosch patent. It has asked for a writ of injunction and an accounting.

To Approve R. C. H. Corp. Sale

DETROIT, MICH., Dec. 9—There is still some doubt that the sale of the R. C. H. Corp. to the Lincoln Realty Co. and C. J. O'Hara and W. J. Baird will be confirmed by the courts, due to a petition which was entered by several of the larger creditors who believe that a slightly higher bid for the entire assets may yet be secured. The parties named above made a joint bid of $295,000.

However, a meeting of the creditors has been set by Referee in bankruptcy Lee Joslyn for December 20, and at that time the contract which has been entered into will be approved unless the creditors show good cause why such action should not be taken.

The sale contract of $295,000 has been made out in the name of the Todd-Frank-Friedberg Co., Ltd., which the joint bidders above represented. It is the intention of the latter concern which has just been formed to continue the making of the R. C. H. car, although several alterations in design and construction are possible.

French Imports and Exports Increase

PARIS, Nov. 28—The depression which was felt in the French automobile industry during the month of September has disappeared during October, the value of the exports for the first 10 months of this year being $3,785,960 in excess of the corresponding period of 1912. The disquieting feature from the French standpoint is the increased imports. For the first 10 months of 1913 they have reached the figure of $3,302,760, being an increase of $1,056,960 compared with the corresponding period of last year. England has sent up her figures during this period from $505,860 to $1,092,660. The United States has increased her sales from $722,640 to $911,340; German figures are $342,360 in 1912 and $445,200 in 1913. Italy has risen from $212,940 to $269,820, and the Belgian increase is $83,040.

The French have lost trade with three countries: Belgium $1,234,140 less than in 1912; United States $333,360 less, and Brazil $543,900. The Belgian decrease, which is the greatest, is explained by lowered exports to other countries of which Belgium was only the re-export agent. All other countries show an increase, the official figures for the French exports during January-October, 1912 and 1913, being as follows:

	1913	1912
England	$9,645,540	$9,536,000
Belgium	6,732,000	7,966,140
Algeria	3,660,240	3,052,980
Germany	3,195,480	2,698,560
Argentine Republic	2,769,420	2,314,620
Brazil	1,608,180	1,716,960
Russia	1,209,300	384,840
Italy	1,148,160	868,560
Spain	1,148,160	808,560
Switzerland	809,100	769,020
Morocco	559,020	.....
United States	524,460	857,820
Austria	238,680	174,780
Turkey	157,800	120,660
Other countries	5,040,780	3,861,600
	$38,295,240	$34,509,280

Batavia Rubber Declares Dividend

BATAVIA, N. Y., Dec. 9—The Batavia Rubber Co. has declared the regular quarterly dividend of 1.5 per cent. on the preferred stock, and the regular quarterly dividend of 1 per cent. and an extra dividend of ½ of 1 per cent. on the common stock, payable January 1.

Stevens-Duryea Re-elects Officers

CHICOPEE FALLS, MASS., Dec. 10—At the annual meeting of the Stevens-Duryea Co., the following officers were re-elected: President, W. H. Whiteside; vice-president, J. Frank Duryea and clerk, W. M. Remington. Mr. I. H. Page retired as treasurer.

Market Changes of the Week

Few changes of any importance took place in this week's markets. Tin again dropped, closing at $37.38, at a loss of $1.37 per 100 pounds. At the London market, tin was again heavy, weak and lower. Consumers continued very conservative, with very little demand. Antimony is dull, remaining at $0.06. In the local market there were again offerings of American electrolytic copper at $0.14 1-4 a pound. The demand from the consumers continued light. Buying of finished material has been further reduced and apparently manufacturers have ample stocks, with deliveries on contracts in sufficient tonnage to keep them out of the market temporarily. Lead came down $0.25 per 100 pounds, closing at $3.85. The rubber markets remained steady throughout the week, quiet trading conditions prevailing.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Change
Antimony, lb.	.06	.06	.06	.06	.06	.06	.....
Beams and Channels, 100 lbs.	1.36½	1.36½	1.36½	1.36½	1.36½	1.36½	.....
Bessemer Steel, ton	20.00	20.00	20.00	20.00	20.00	20.00	.....
Copper, Lake, lb.	.14⅜	.14⅜	.14⅜	.14⅝	.14⅝	.14¼	— .00⅛
Copper, Lake, lb.	.14⅝	.14⅝	.14⅝	.14⅝	.14⅝	.14⅝	.....
Cottonseed Oil, bbl.	7.03	7.03	7.03	7.00	7.00	6.98	— .05
Cyanide Potash, lb.	.17	.17	.17	.17	.17	.17	.....
Fish Oil, Menhaden, Brown	.38	.38	.38	.38	.38	.38	.....
Gasoline, Auto, 200 gals.	.22¼	.22¼	.22¼	.22¼	.22¼	.22¼	.....
Lard Oil, prime	.93	.93	.93	.93	.93	.93	.....
Lead, 100 lbs.	4.10	4.10	4.10	4.10	4.10	3.85	— .25
Linseed Oil	.50	.50	.50	.50	.50	.50	.....
Open-Hearth Steel, ton	20.00	20.00	20.00	20.00	20.00	20.00	.....
Petroleum, bbl., Kansas, crude	1.03	1.03	1.03	1.03	1.03	1.03	.....
Petroleum, bbl., Pa., crude	2.50	2.50	2.50	2.50	2.50	2.50	.....
Rapeseed Oil, Refined	.62	.62	.62	.62	.62	.62	.....
Rubber, Fine Up-River, Para	.73	.73	.73	.73	.73	.76	+ .03
Silk, raw Italy	....	4.10	....	....	4.95	4.95	+ .85
Silk, raw Japan	....	3.90	....	....	3.93	3.90	.....
Sulphuric Acid, 60 Baume	.90	.90	.90	.90	.90	.90	.....
Tin, 100 lb.	38.75	38.70	38.50	38.15	38.00	37.38	—1.37
Tire Scrap	.05½	.05	.05	.05	.05	.05	.00½

Tiffany Is New Design

First Low-Priced Electric, Selling for $750, Has Distinctive Body and Novel Mechanical Features

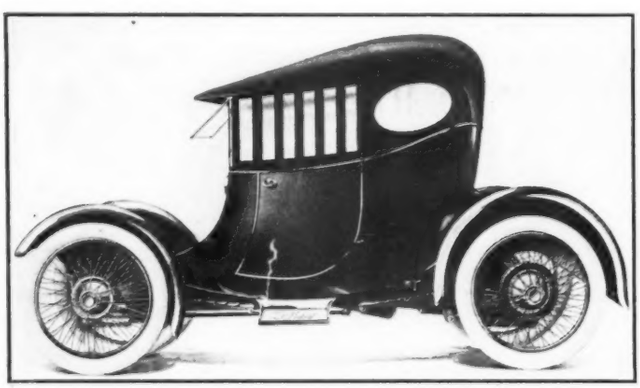
DETROIT, MICH., Dec. 8—Details of the new $750 Tiffany electric, of the Tiffany Electric Co., Pontiac, Mich., show that this new vehicle, which sets an unprecedentedly low price in the electric field is really a new design. The vehicle illustrated herewith has a most unconventional body design carried on a chassis with 92-inch wheelbase and 54-inch tread. The body represents the minimum of cost with a maximum of useful space. The battery, twenty-four cells Willard and weighing 575 pounds, is carried under the rear. It is rated at 102-ampere hours at the 6-hour rate. The motor, a Wagner type, transmits direct to the back axle through a worm deduction of 9.8 to 1. The car is fitted with detachable wire wheels which are interchangeable on all hubs. The front axle is of tubular design and the rear axle of a robust construction. A double cantilever spring suspension system is used with rear springs 38 inches long and fronts 32. The suspension of the body is such that with passengers the distribution of weight between the axles is in the ratio of 3 to 1 on the rear wheels. The vehicle with all equipment weighs 1,430 pounds. The mileage per battery charge is 100 at a rate of 15 miles per hour. Steering and control have received attention, all control reposing in the right hand of the operator, so that a forward movement gives power and a backward movement applies the brakes. A variation of the conventional pillar steering is employed.

Continue Fight on International Motors

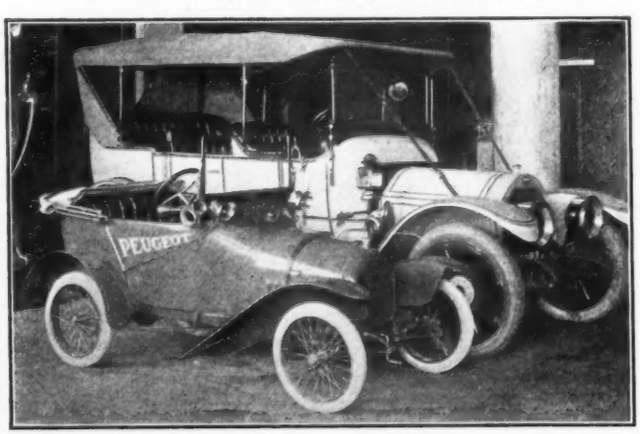
NEW YORK CITY, Dec. 5—The fight to prevent the merger of the Mack Bros. M. C. Co., and the Saurer Motor Co. into the International Motor Co. and a bond issue of $1,250,000 by the latter company came on before Justice Benedict, in the motion term of the Supreme Court, recently, on a demurrer interposed by the International Motor Co. in the injunction suit brought by G. E. Blakeslee, a stockholder.

Mr. Blakeslee claims that the consolidation of the two companies is tainted with fraud. He owned 187 shares of the Mack Bros. M. C. Co., which, he says, were worth $200 per share. An agreement of consolidation was entered into in 1911, he says, by which the assets of the two merging companies were to be audited as a basis for a distribution to the stockholders of the two companies of the stock in the new holding company. Trustees were appointed to carry out the agreement.

On the argument, the counsel for Blakeslee declared that while the assets of the Mack Co. were placed at $1,110,000 the assets of the Saurer Co. were put at over $500,000 by one audit company and at $4,500 by another, and that there was never any effort made to reconcile this difference between the figures of the two audit companies. He also claimed that the trustees went on and consolidated on the basis of the higher audit, and that that wiped out certain liabilities of the Saurer company.



The new Tiffany electric, designed to sell at $750



How the Baby Peugeot looks beside the big Peugeot

New Stickley Motorette Appears

ST. PAUL, MINN., Dec. 8—The Charles A. Stickney Co., of this city, has brought out a new motorette which is shown in the accompanying illustration. It is neither an automobile nor a cyclecar, being a narrow-gauge, low-hung, two-passenger tandem car with a four-cylinder, water-cooled motor of 12-15 horsepower. The stroke is 5 inches. The car sells for $395 as a passenger or parcel car and for $410 as a combination of both.

New Cyclecar in Toledo

TOLEDO, O., Dec. 7—The Toledo Auto-Cycle Car Co., was recently incorporated with a capital stock of $20,000 for the purpose of manufacturing cyclecars. The most active man in the new enterprise is said to be C. W. Carlisle who declares that his car will be a surprise to the public. It will be exhibited here in the near future. A plant site has been secured according to the incorporators but no further information has been given out.

Flyer Co. Will Handle Its Own Output

DETROIT, MICH., Dec. 5—The Flyer M. C. Co. recently incorporated in Detroit, will handle its output directly through its offices in this city. Its factory is at Mount Clemens, Mich. The contract with the Thomas Howard Co., Brooklyn, N. Y., to handle its car, has been cancelled. The car will sell for $495, including electric lights, storage battery and speedometer, and an additional price of $100 for complete electric lighting and starting system.

New Method of Drying Body Wood

MILWAUKEE, WIS., Dec. 8—Manufacturers of motor car bodies will be interested in the announcement just made by the Forest Products Laboratory, operated by the Department of the Interior in conjunction with the University of Wisconsin at Madison, that it has achieved commercially successful drying of wood for vehicle stock material by the use of a newly invented, humidity-regulated kiln. Manufacturers have previously never been entirely successful in curing wood by the use of artificial heat because of the high per cent. of waste incurred by checking, warping and other losses caused by uneven drying.

Milwaukee Motor Meeting December 18

MILWAUKEE, WIS., Dec. 8—Creditors of the Milwaukee Motor Co., bankrupt, refused to accept the proposition of John C. Coerper and Ernst G. Miller to take up the concern's indebtedness at various banks in consideration of a release of all claims on the part of the bankrupt and the trustee against Ernst G. Miller, Harry G. John and Elise K. John. The meeting to consider the offer was originally scheduled for November 28, then adjourned to December 8, and was today again adjourned to December 18, at which time it is expected that other propositions will be made to creditors.

Three Pope Receivers Wanted

HARTFORD, CONN., Dec. 5—Three receivers for the Pope Mfg. Co. of this city are desired. At present Colonel George Pope is the sole temporary receiver in the Connecticut jurisdiction. The Pope company was recently made a Massachusetts corporation. Three receivers have been named by the courts in Massachusetts. The matter was before Judge William S. Case in the superior court here today, the hearing being for the purpose of making Colonel George Pope permanent receiver. The Massachusetts interests, much in evidence during the hearing on

the appointment of Colonel Pope as temporary receiver were represented today. There was no opposition this time to the appointment of Colonel Pope as permanent receiver by the Massachusetts delegation but they did hold out for the appointment of two more receivers. Charles A. Morss, of Boston, and Charles A. Persons, the saddle manufacturer of Worcester are wanted to act in this jurisdiction with Colonel Pope. All three men named have been duly appointed by the Massachusetts courts. At the close of the hearing Judge Case reserved decision.

It was announced early this week that three hundred men are now at work in the Hartford plant and that four hundred cars would be assembled. The new model four is involved in the scheme.

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Ford to Distribute from Louisville

LOUISVILLE, KY., Nov. 29—Following the purchase of a plot of ground at Third avenue and the L. & N. railroad crossing, announcement was made today that the Ford Motor Co. has decided to establish a distributing agency for the South in Louisville. A building to cost in the neighborhood of $200,000 and to be used as sales quarters and for assembling automobile parts for the Southern trade will be erected. Work will be started in the near future. Officials of the company had been looking over sites for several months. The plant, it is said, will be similar to branches in many other large cities and will employ a large force of men. The property acquired by the Detroit concern has a frontage of 620 feet in Third avenue, 900 feet on the L. & N. tracks and 420 feet on the tracks of the Southern Railway.

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Crude Rubber Movement.

NEW YORK CITY, Dec. 9—During November, 2,130 tons of Para rubber were received at Para as compared with 3,221 tons in November, 1912. Para shipments during the last month to Europe totaled 1,630 tons, as compared with 1,010 tons a year ago. The world's visible supply of Para at the end of November amounted to 4,620 tons of Para, as compared with 4,300 tons in 1912.

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Items of Interest to the Trade

NEW YORK CITY, Dec. 8—The Jones Electric Starter Co., Chicago, Ill., has opened the Jesco Equipment Co., this city, as its Eastern representatives. This company occupies the eighth floor of the new building at 245 West Fifty-fifth street. Mr. G. W. Wacker, formerly in charge of the Simms Magneto Co.'s plant, Bloomfield, N. J., is general manager, and F. B. Moskovics, secretary of the Jones Electric Starter Co., is president.

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BUFFALO, N. Y., Dec. 5—The Goodrich and Diamond tire branches in Buffalo have been consolidated, the Diamond branch being closed and the business of the two being concentrated in the Goodrich branch under the management of H. B. Niblette who also takes over the management of the branches in Rochester and Syracuse. J. F. Lanier, former manager here of the Diamond branch has been promoted to a factory position.

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BOSTON, MASS., Nov. 29—After a vigorous fight before the Massachusetts Highway Commission which was attended by about 200 residents of the little island of Nantucket that came up to Boston for the hearing the commission decided that it would uphold the selectmen in their exclusion order on motor vehicles. Cars are exclused now for the summer months, but the new order keeps them off the island all the year.

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NEW YORK CITY, Dec. 5—The Rubber Goods Mfg. Co. has declared the usual quarterly dividend of 1.75 per cent. on its preferred stock and a dividend of 1 per cent. on its common stock, payable December 15 to holders of record December 10.

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BOSTON, MASS., Dec. 5—The Hood Rubber Co. is offering preferred shareholders right to subscribe to half of the newly authorized $1,000,000 preferred at par, in ratio of one new for three old shares. Subscriptions expire December 20, by which date payment in full must be made.

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NEW YORK CITY, Dec. 10—The Electric Appliance Co., of New Orleans, La., will handle the complete line of Invader oils, etc., for that territory, including Mississippi, the southern part of Alabama, and the western coast of Florida, including a small portion of Arkansas and Georgia.

New Motor Law for Ohio

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State Authorities Capitulate to Automobilists and Agree to Meet Association Officials on New Measure

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COLUMBUS, O., Dec. 8—At last the state officials of Ohio, led by Governor Cox and Secretary of State Graves, have capitulated to the automobile owners in the Buckeye State. Since the decision declaring the Warnes automobile law unconstitutional, the state administration has agreed to meet with the officials of the Ohio Automobile Association and representatives of the A. A. A. in drafting an equitable vehicle law. Previously every effort to volunteer services on the part of automobile owners or clubs met with rebuffs.

The meeting has been scheduled for December 13 when the views of the state organization will be given to the governor and secretary of state. The establishment of a vehicle commission, which will have the authority to draft and recommend a law to the next Ohio legislature will be demanded by automobilists. The confused condition of the Ohio automobile law is the cause for the surrender of the state officials.

With scarcely more than 2 weeks elapsing before the new year, there is no certainty as to the registration law in the state. The question of the constitutionality of the old law, which provided for a flat rate of $3 for electrics and $5 for gasoline cars is a mooted one. At any rate owners in the state are not applying for registration under any law and are waiting developments.

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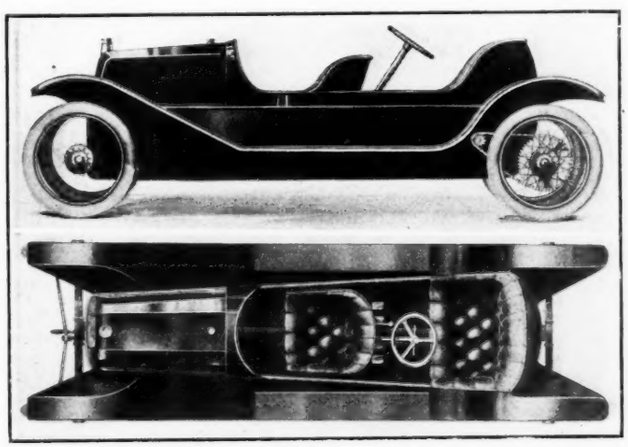
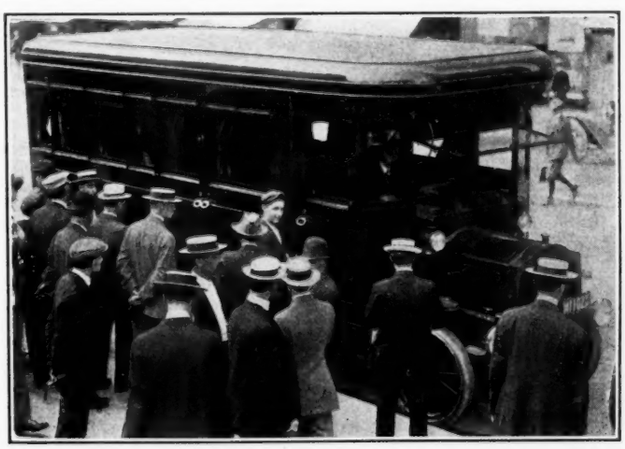
CLEVELAND, O., Dec. 5—On November 13 the Baker Motor Vehicle Co., of Cleveland, called to order its Second Annual Convention. Dealers from every section of the country attended



Side and plan views of Stickley motorette, $395



Packard funeral car combining coaches (Underwood)

S.A.E. Appoints Membership Committee

Adds to Winter Program—Official Ballots Show That H. M. Leland Is Slated for Presidency

NEW YORK CITY, Dec. 5—The governing committee of the Metropolitan Section of the S. A. E. has appointed the following on the membership committee: chairman, M. R. Machol, L. G. Busby, J. R. Cautley, C. W. Fletcher, Henry Van Riper Sheel, H. W. Slauson, J. E. Schipper, W. J. Sommers, E. R. Waterman, R. B. Whitman, A. M. Wolf, and F. C. Wulf.

Henry M. Beland, founder of the Cadillac M. C. Co., and now its advisory manager, is slated for the presidency of the S. A. E. for 1914. Official ballots mailed to members this week disclose other nominees for offices including William Guy Wall, National Motor Vehicle Co., and K. W. Zimmershied, General Motors Co., vice-presidents, to serve for one year; and H. C. Wilson, consulting engineer, and Christian Girl, president and manager of the Perfection Spring Co., members of the council, to serve for 2 years. Hermann F. Cuntz is nominated for re-election as treasurer.

The winter program has been lengthened by several additional papers at the annual winter meeting to be held in Grand Central Palace during January 6 and 8 next. W. J. B. Thomas, chief engineer of the Century Electric Car Co., Chicago, Ill., will read at the afternoon session, January 6, on "The Need for Dissemination of Electric Vehicle Data." At the same session "Automobile Effectiveness," by D. L. Gallup, assistant professor of gas and engineering of the Worcester Polytechnic Institute, will be read. At the evening session the same day, "Taxicab Design," by L. P. Prossen, will be read. On January 8, "Electric Gear Shifting," by Frank N. Nutt, chief engineer of the Haynes Automobile Co.; "The Possibilities of the Cyclecar," by W. B. Stout; "Radiators," by J. W. Cain, chief engineer of the McCord Mfg. Co., will be read at the evening session. Two papers will be read at the afternoon session of that date, the first, "An Electrically Controlled Dyanamometer for Testing Gas Engines," by N. C. Johnson, and "The Exhaust Discharge and the Utilization of its Energy," F. C. Mock, engineer of the Stromberg Motor Devices Co.

Detroit S. A. E. Considers Truck Wheels

DETROIT, MICH., Dec. 8—Under its policy of keeping in touch with all parts of the industry rather than catering entirely to the passenger car field in which the majority of the members are engaged, the Detroit Section, S. A. E. dealt with commercial car wheels, steel and wood, on December 4.

Melvin F. Doty, of Isaac G. Johnson & Co. read a paper by J. Morat which was prepared in answer to a recent paper by Arthur J. Slade on Motor Truck Wheels. It was pointed out that the steel wheel in this country is comparatively new and that the early failures were largely due to lack of co-operation between the truck engineer and the practical foundry man. With the proper relation between these two it has become possible to produce heat-treated cast steel wheels of the same weight and much greater strength than the usual wood wheel. For trucks of less than 2-ton capacity it is doubtful if wood wheel weights can be equaled, although some truck makers have chosen to use the steel even for these light loads.

Foundry practice has so far advanced that the voidable defects, such as cracks and blowholes, are inexcusable and the effects of small sand holes may be minimized. Tests show that these small sand holes produce weakness only when the steel is under tension. By considering the side of the wheel that has the greater tensile strains and then casting that side in the nowel or drag, perfect castings for the purpose can be made.

The unit construction of the cast wheel is especially desirable in countries where the weather is very dry or changeable. Probably this phase was one of the considerations that led to the specifying of steel wheels in the English War Department Subsidy Scheme of 1912.

Steel Wheel Easy to Standardize

The first of this year Mr. Doty sent out letters to the tire manufacturers asking for their views on the steel wheel problems. The replies showed that when the S. A. E. truck wheel standards were adopted the wood wheel makers had considerable difficulty in meeting them, but that conditions under these standards have greatly improved, although there is still some carelessness as to dimensions and roundings. The steel wheel is particularly adapted to holding to the standards so much desired by the tire men and from their point of view this is one of the great advantages of this type. One company suggested that the cast wheels be made with the number of spokes equal to the number of niches in the radius of the S. A. E. felloe band. They did not, however, give their reasons for this.

The subject of Wood Wheels on Heavy Vehicles was treated by Clarence B. Hayes, of the Hayes Wheel Co. In Mr. Hayes' absence the paper was read by Royal Mudge, of the same concern. One of the points emphasized was that the motor truck wheel is as distinct a problem from that of the pleasure car wheel or even the horse drawn truck wheel as the auto is in relation to the carriage wheel. To cite one point of difference, it will be remembered that the horse truck wheel has a 3-4-inch outer steel band and is not intended to have a rubber cushion while the motor truck wheel has a light band of from 1-4 inch to 3-8 inch thick but is intended to carry a rubber tire of considerable thickness. If the owner allows the tire to wear very thin, as many do, the wheel will not stand up to conditions for which it was not designed, and he is throwing away just so many years of wheel life.

Tests Show Strength of Wood Wheels

Mr. Hayes quoted some tests made at the laboratories of the University of Michigan, which showed the great strength of properly made wood wheels. There have been big improvements in the last few years in the design and manufacture of wood wheels and it was claimed in this paper that the old troubles of "out of round" and "loosening up" have been entirely overcome. As to the greater dissipation of heat in the steel wheel Mr. Hayes is skeptical, he believing that the heat is taken up by the air near the point of contact rather than transmitted through the rubber tire, steel band and then to the wheel proper.

During the discussion Adolph Schreiber explained a model we had of the "Record" demountable rim. This is a European product which was personally tested by Mr. Schreiber in long tour in England and on the Continent. Among the claims for this rim is its safety, quickness of operation, and lack of loose parts which might become mixed or lost.

Acting Chairman Cornelius T. Myers pointed out the misuse of the word resiliency as applied in relation to wheels. The misunderstanding as to the terms crystallization and fatigue of steel was also commented upon. The discussion showed that the wheel makers were working well within the 1-8 inch S. A. E. standard for out of round, often holding it as low as 1-32 inch.

However, Mr. Mudge would not go on record as favoring the lowering of this 1-8 inch tolerance, as was suggested by Secretary Connell.

I. A. E. Summer Visit in Belgium

NEW YORK CITY, Dec. 10—At the last meeting of the councils of the Institution of Automobile Engineers it was decided that the summer visit for 1914 should be paid to Belgium. It is probable that Brussels will be made the headquarters.

Adopt Standard Chassis Width

PARIS, Nov. 26—At a recent meeting of the International Association of Automobile Manufacturers it was agreed that the standard chassis width should be 800 millimeters, 35-43 inches. This dimension is the width from outside to outside of main frame members. The adoption of this width is part of the scheme towards the unification of chassis sizes with a view to facilitating the work of body makers. The principle of the scheme has already been adopted by all European automobile manufacturers connected with the International Association. Many of the official dimensions, which comprise length, kick-up, inclination of steering column, position of levers, etc., have not yet been definitely determined, and it is probable that a year will elapse before this scheme will go into effect.

NEW YORK CITY, Dec. 9—A four story building will be erected at 553 and 555 West Fifty-seventh street for the occupancy of the Kelly Springfield Tire Co.

New York Trade Association Elects Officers

ALBANY, N. Y., Dec. 5—Arthur M. Day, of New York City, was elected president of the recently organized Automobile Trade Association of New York. C. D. Hakes, of Albany, was elected vice-president, R. E. Brown, of Buffalo, treasurer, and C. A. Stewart, of New York, secretary and general manager. The following associations were elected to membership; Albany, Buffalo, Rochester, Syracuse, New York City, Brooklyn and the

Automobile Importers Alliance. The following delegates were elected directors: A. M. Day, R. E. Brown, C. D. Hakes, G. H. Norris, Thomas Northway, E. Lascaris, and H. L. Carpenter.

Association Organizes Russian Division

NEW YORK CITY, Dec. 10—The National Assn. of Manufacturers has organized a special division for the Russian trade. There will be a conference at the offices of the association, 30 Church street, on Tuesday, December 16, at 3 p. m., on the occasion of the inauguration of the new service. An address will be made by Mr. C. J. Medzikhovsky, commercial attache to the Imperial Russian Embassy at Washington. Other speakers conversant with the Russian trade conditions will address the conference regarding trade and other conditions through the empire at the present time.

Seven Tire Exhibitors for Shows

NEW YORK CITY, Dec. 9—Work has been started at the Grand Central Palace. Mr. Miles is taking advantage of the unoccupied floors and has men at work getting the spaces for the accessory exhibits in shape. Several tire concerns have been added to the list of tire exhibitors since the announcement was issued several weeks ago. In all there are seven tire exhibitors for the New York show. The following makers of tires and their accessories will exhibit at the show: Braender, Miller, Newmastic, Overman, Cataract, Powodnick, Thermoid, Double Fabric Tire Co., Voorhes Rubber Mfg. Co., United & Clove Mfg. Co., National Rubber Co., and the Essex Rubber Co.

Cincinnati Dealers in Split

CINCINNATI, O., Dec. 5—A number of men interested in the automobile trade met yesterday at the Hotel Metropole and formed a new organization to be known as the Cincinnati Automobile Trades' Association, with a membership of thirty-five. The reasons for organizing is disapproval of the management of the annual automobile shows. It is said by the members of the new organization that the members of the Cincinnati Automobile Dealers' Association, whose membership numbers about sixteen in all, have benefited through being afforded free space at the past shows at which non-members were forced to pay high prices. The new association members will probably hold a show in the new Union Central Life Insurance Building, if their demands for reduced rates are not granted.

Only Sanction Now Needed for Big Races

LOS ANGELES, CAL., Dec. 10—*Special Telegram*—The preliminary steps toward having the Grand Prize and Vanderbilt Cup road races at Santa Monica on February 22 and 24 have been cleared away. Leon Schettler announced today that he had accepted all terms for the two races.

The bringing of these races to this city has been due, as announced in THE AUTOMOBILE of November 27, to the work of Finley R. Porter, of the Mercer Co., Trenton, N. J., who, since the abandonment of these races by the Savannah people some months ago, has been working at the request of the Motor Cups Holding Assn., New York City, to run them off at some other place. The race will be for cars of 600 cubic inches and under, and with a course approximately 300 miles. According to the A. A. A., no sanction has yet been given for the race.

Automobile Speedway in Philadelphia

PHILADELPHIA, PA., Dec. 8—A charter application for an intended corporation to be called the Philadelphia Motor Speedway Assn., the purpose of which is to acquire lands on which to construct a track for motor races, etc., was recently made. The proposed speedway will be constructed in the Old York Road above Willow Grove, Pa., and will ultimately represent an expenditure of approximately half a million dollars.

Louis Disbrow Again Stars in Texas

All Races Won at Speeds of Over 60 Miles an Hour in Second Day at San Antonio

SAN ANTONIO, TEX., Nov. 30—Louis Disbrow in his Simplex Zip today in preliminary heats and finals of free-for-all events thrice beat Ralph De Palma in the latter's Mercer. On each occasion at the close of the 6 miles on the three-quarter mile track Disbrow led by half the length of the homestretch. In all classes the races were won on time better than 60 miles an hour. Bill Chandler of the unfortunate Mason team went over the bank in the first race of the afternoon, sustaining painful injuries. He is not regarded as dangerously injured, however.

Free-For-All—6-mile

CAR	DRIVER	TIME
Mercer	De Palma	5:59
Case	Endicott	
Case	Heinemann	

Second Heat

Simplex	Disbrow	5:46
Staver	Monckmeier	
Case	Raimey	

Finals

Simplex	Disbrow	5:33⅕
Mercer	De Palma	
Staver	Monckmeier	

9-mile—300 Cu. In.

Mason	Mason	8:54
Case	Raimey	
Case	Heinemann	

12-mile—450 Cu. In.

Mercer	De Palma	11:33⅖
Mason	Mason	
Case	Raimey	

9-mile—450 to 600 Cu. In.

CAR	DRIVER	TIME
Simplex	Disbrow	8:33⅗
Staver	Monckmeier	
Case	Endicott	

Free-For-All—2 Heats—6-mile

First Heat

Mason	Mason	5:37
Staver	Monckmeier	
Case	Heinemann	

Second Heat

Simplex	Disbrow	5:32
Mercer	De Palma	
Case	Raimey	

Final

Simplex	Disbrow	5:30
Mercer	De Palma	
Staver	Monckmeier	

Belgium Grand Prix July 25

PARIS, Nov. 26—Belgium will hold its Grand Prix races on July 25 and 26. There will be two distinct races: On the first day cars of 2.5 liters maximum cylinder area will be eligible. Each round will have to be covered at a minimum speed varying with the cylinder area, the failure to maintain this average on any round entailing penalization. Awards will be made on team performances. On the second day there will be a speed contest for cars having a maximum cylinder area of 4.5 liters.

Massachusetts Registration Increased 12,528

BOSTON, MASS., Dec. 8—The fiscal year of the Massachusetts Highway Commission is just ended and it shows that there has been an increase of about 25 per cent. in the amount of business over that of 1912. The commission has taken in from motorists $764,153.51. This is an increase of nearly $150,000 over 1912. There were 62,660 motor vehicles registered, an increase of 12,528 over last year. These totals do not include the cars of manufacturers and dealers, or motorcycles. Including these there were registered more than 76,000 vehicles, while the gain in both receipts and cars is greater this year, the percentage of gain is slightly less than that of last year over its predecessor, which was 29 per cent. There were 5,948 commercial vehicles registered this year, a gain of about 47 per cent. over last year. The greatest gain this year is in the cars in the 20 to 30 horsepower class. The owners of these cars pay more than twice as much as the owners of the 30-40 horsepower division. But in number of cars registered the $5 class for those under 20 horsepower leads all others. Here are the comparative figures for the last 2 years:

	1912	1913	Increase	1912	1913	Increase
Motor vehicles	50,132	62,660	12,528	$492,482.50	$616,133.00	$123,640.50
Motorcycles	5,034	7,127	2,093	9,664.00	13,508.00	3,564.00
Manu acturers and dealers	1,114	1,330	216	32,587.50	32,552.50	*35.00
Operators' licenses	14,693	17,009	2,316	29,386.00	34,018.00	4,632.00
Chauffeurs' licenses	5,570	5,233	*337	11,140.00	10,466.00	*674.00
Operators' renewals	32,255	40,858	8,603	16,127.50	20,429.00	4,301.50
Chauffeurs' renewals	14,127	17,934	3,807	7,063.50	8,967.00	1,903.50
Examinations	7,018	7,288	270	14,036.00	14,576.00	540.00
Duplicate licenses and certificates	2,112	2,946	834	1,056.00	1,473.00	417.00
Number plates, seals	...	...	...	1,147.00	1,089.25	*37.75
Miscellaneous	...	...	...	1,580.94	10,941.76	9,360.82
Totals				$616,245.94	$764,153.51	$147,907.57

*Decrease.

LOCK Factory in Findlay—The United States Auto Lock Co., recently organized in Findlay, O., has decided to build a factory for the manufacture of locks in that city. The lock is a device that attaches to the gear. The president is Dr. E. B. Brokaw.

Faultless Tire Addition—Plans will be started soon for a three-story brick or steel addition to the plant of the Faultless Rubber Co., Ashland, O.

Chester Rubber Adding Machinery—The Chester Rubber Tire & Tube Co., Chester, O., is installing new mechanical equipment in its plant and expects to be in full operation by January 1.

Top Plants Sold—F. W. Herbst, as receiver for the Barndt-Johnson Co., Columbus, O., an automobile top and accessory concern, sold the plants and assets to W. H. English, trustee for the mortgage holders, for $20,000. The concern will be continued in operation.

United Reclaiming Factory Moved—The factory of the United Rubber Mfg. & Reclaiming Co. will be established at St. Catherines, Ont. R. J. Cluff, general manager of the Steel & Radiation, Ltd., is president, and G. C. Rough, sales manager of the Packard Electric Co., is director. Building will commence in April.

Standard Aluminum's Addition—The Standard Aluminum Co., Two Rivers, Wis., is building a large addition to its plant, which will include a complete rolling mill. The company is also establishing a garage shop for motor cars and cycles and providing room for the cars and cycles owned by its officials and employees.

Folberth in New Building—The Folberth Auto Specialty Co. has completed its new building at Lake avenue and West Eightieth street, Cleveland, O., and now has a thoroughly modern plant. The firm is now composed of F. W. and W. L. Folberth, who have been identified with the automobile industry for many years. The company intends to specialize in foreign car service and is patentee of the Folberth auto tire pump and the Folberts carbureter.

L. P. C. Working at Top Speed—The L. P. C. Motor Co., Racine, Wis., announces the appointment of O. R. Delamater as superintendent and C. B. Chamberlain as purchasing agent. The new plant is working at top speed and deliveries of the new Racine car product are expected ahead of the original schedule, which was February 1.

Many Plants in Long Island—The General Vehicle Co., Long Island City, has about completed its new structure, 100 feet by 500 feet, to be used in addition to its present plant for the manufacture of electric motor automobiles, and another structure has been built for the manufacture of gasoline motor cars of the Mercedes make, under patent rights of the foreign company. The plant, already representing an investment of $6,000,000, is the largest electric motor truck plant in the world. The company expects to put up five more buildings like the new one mentioned. The Palmer-Singer Co., Simplex Auto Co., Harrold M. C. Co., Lozier M. C. Co. and the Benz M. C. Co. all have big establishments within a mile of the Bridge Plaza. Among the automobile accessory plants is that of the Goodyear Tire Co., which has built a larger warehouse, which is a central point from which goods are supplied to every one of its depots from Boston to Philadelphia, and as far West as Pittsburgh and Buffalo. The Prest-O-Lite Co. and the Metal Stamping Co., manufacturers of automobile accessories, also have important branch buildings in that city. The opening of the Queensboro Bridge brings a large section just about the easterly portal of that structure within direct communication through Fifty-ninth street with the hundreds of automobile salerooms on Broadway, less than two miles away, and has induced many of these concerns to establish warehouses, assembling plants and repair stations in that locality. The Brewster Co. has a $600,000 building right on the Plaza in that city. The Ford Co. has a $1,000,000 plant on Jackson avenue, the enlargement of which is nearly completed, and the Packard Co. also has a fine structure on the Queens Boulevard.

The Automobile Calendar—Shows, Meetings, Etc.

Dec.	6-13	Toledo, O., Annual Show, Factories Bldg., Toledo Auto Shows Co.
Dec.	9-13	Philadelphia, Pa. Annual Convention of American Road Builders' Association.
Dec.	11-20	New York City, First International Exposition of Safety and Sanitation, under the auspices of the American Museum of Safety.
Dec.	17-20	Davenport, Ia., Anual Show, Armory Hall, Tri-City Auto Dealers' Assn.
Jan.	2-10	New York City, Importers' Automobile Show, Hotel Astor.
Jan.	3-10	New York City, Automobile Show, Grand Central Palace.
Jan.	5-10	Los Angeles, Cal., Automobile Show, Grand Avenue Pavilion.
Jan.	10-16	Milwaukee, Wis., Sixth Annual Show, Auditorium, Milwaukee Automobile Dealers' Assn.
Jan.	10-17	Cleveland, O., Automobile Show, Wigmore Coliseum, Cleveland Automobile Show Co.
Jan.	10-17	Philadelphia, Pa., Show Metropolitan Building, Automobile Trade Assn., H. W. Terry, Secretary.
Jan.	12-17	Bridgeport, Conn., Annual Automobile Show, State Armory, B. B. Steiber, manager.
Jan.	17-24	Pittsburgh, Pa., Annual Automobile Show, Automobile Dealers' Assn.

Race Meets

Jan.	10-21	Brussels, Belgium, Salon de l'Automobile du Cycle et des Sports; Chambre Syndicale de l'Automobile et du Cycle de Belgique.
Jan.	24-31	Montreal, Que., Automobile Show, Passenger Cars, Montreal Automobile Trade Assn.
Jan.	24-31	Rochester, N. Y., Automobile Show, Exposition Park, Rochester Automobile Dealers' Assn.
Jan.	24-31	Chicago, Ill., Automobile Show, Coliseum and First Regiment Armory.
Jan.	26-31, 1914	Scranton, Pa., Automobile Show, Automobile Assn. of Scranton.
Jan.	31-Feb. 7	Minneapolis, Minn., Automobile Show.
Feb.		Hartford, Conn., Show.
Feb.		St. Louis, Mo., Show.
Feb.	2-7	Buffalo, N. Y., Automobile Show, Buffalo Automobile Dealers' Assn.
Feb.	3-7	Montreal, Que., Motor Truck Show, Montreal Automobile Trade Assn.
Feb.	4-7	St. Joseph, Mo., Anual Show, St. Joseph Auditorium, St. Joseph Automobile Show Assn.
Feb.	7-12	Seattle, Wash., Anual Automobile Show, State Armory Bldg., W. I. Fitzgerald, Manager.
Feb.	9-14	Buffalo, N. Y., Truck Show, Buffalo Automobile Dealers' Assn.
Feb.	9-14	Grand Rapids, Mich., Fifth Annual Western Michigan Show, Klingman Furniture Exposition Bldg., *Grand Rapids Herald.*
Feb.	9-14	Buffalo, N. Y., Commercial Car Show, Buffalo Automobile Dealers' Assn.
Feb.	14-21	Pittsburgh, Pa., Automobile Show, Pittsburgh Auto Show Assn.
Feb.	16-21	Kansas City, Mo., Auto Show.
Feb.	18-21	Bloomington, Ill., Automobile Show, McLean County Automobile Club.
Feb.	21-28	Newark, N. J., Automobile Show, N. J. Auto Trade Assn.
Feb.	21-28	Cincinnati, O., Automobile Show, Cincinnati Automobile Dealers' Assn.
Feb.	23-28	Omaha, Neb., Automobile Show, Omaha Automobile Assn.
Mar.	2-4	Cincinnati, O., Commercial Vehicle Show, Cincinnati Automobile Dealers' Assn.
Mar.	2-6	Fort Dodge, Ia., Show, Fort Dodge Auto Dealers' Assn.
Mar.	7-14	Boston, Mass., Automobile Show.
Mar.	9-14	Des Moines, Ia., Show, Des Moines Automobile Dealers' Assn.
Mar.	17-21	Boston, Mass., Truck Show.
Apr.	9-15	Manchester, N. H., Automobile Show.
May	30	Indianapolis, Ind., 500-mile Race, Indianapolis Motor Speedway.

The Week in the Industry

Motor Men in New Roles

GOODYEAR'S Toronto Changes—The Goodyear Tire & Rubber Co., of Canada, Ltd., has announced several changes in the personnel of the sales department at the Toronto, Ont., office. P. D. Saylor, vice-president and sales manager of the Canadian company, has been made president and managing director of the Goodyear Tyre & Rubber Co., Great Britain, Ltd. R. P. D. Graham, secretary and manager of the automobile tire department, has been promoted to the position of sales director, succeeding Mr. Saylor. H. C. Lower, formerly assistant manager of the tire department of the Akron, O., company, succeeds Mr. Graham as manager of that department.

Egan Resigns—F. A. Egan has resigned as editor of *Motor Print*.

Stewart Treasurer Morgan Tire—G. H. Stewart has become treasurer of the Morgan Marshall Rubber Co., East Liverpool, O.

Cox with Hudson Export—W. H. Cox has joined the Hudson Export & Import Co., New York City, as special representative for the A. V. shock absorber.

Stratton Dies—C. H. Stratton, designer and manufacturer of the Stratton car, died suddenly last week at his home in Muncie, Ind., following a stroke of paralysis.

Harris with Cole Branch—E. H. Harris, formerly sales manager for the Cole factory, Indianapolis, Ind., is now in charge of the Cole agency in Los Angeles, Cal.

Millington Detroit Steel Representative—Theodore Millington has been appointed Detroit representative for the Pressed & Welded Products Co., New York City.

Deffrane Resigns—G. C. Deffrane has resigned the position of manager of the Standard Electric Car Co.'s Cleveland, O., branch, and has been succeeded by D. M. Craft.

Faust Promoted—Victor Faust has become manager of the accessory department of the Frankie Co., of Charleston, S. C. He was formerly with Fred Campbell, a St. Louis dealer.

Bradbury Makes a Change—L. H. Bradbury, for many years with the J. W. Maguire Co., handling the Pierce Arrow line, has resigned to accept a position with the Boston agency for the Simplex car.

Randall Resigns—F. M. Randall has resigned from the H. K. McCann Co., Detroit, Mich. Mr. Gleeson Murphy will continue with the company as manager of its advertising business in that city.

Day in New Capacity—Philip Day, formerly of the Portland, Ore., branch of the Metropolitan M. C. Co., recently took charge of the Spokane, Wash., branch of this company, succeeding B. F. Wood.

Fraser with Independent Tire—R. C. Fraser, formerly with the Dunlop Tire & Rubber Goods Co., Ltd., has accepted a position as manager of the Independent Tire Co.'s Montreal, Que., branch.

Teaboldt in Los Angeles—C. R. Teaboldt, formerly with the Packard M. C. Co. in this city, has gone to Los Angeles, Cal. He is connected with Smith Bros., agents for the Peerless and the Ohio electric.

Gentry Cataract Rubber Representative—H. C. Gentry has become a special factory representative for the Cataract Rubber Co., Wooster, O. His headquarters will be with Meyers & Grayson, New York City.

Bristol Motz Tire Manager—G. O. Bristol, previously salesman for the Motz Tire & Rubber Co., Chicago, Ill., is now manager of the commercial tire department for this company, with headquarters at Akron, O.

Back from the Orient—L. W. Place, who left Detroit fourteen months ago on a trip around the world for the General Motors Co., has returned. He came East from Japan. He will resume his trip after a short visit.

Stone Represents Schebler—Earle Stone, chief engineer of Wheeler & Schebler, Indianapolis, Ind., has become manager of the Detroit branch of the company. He succeeds James Ryan, who resigned recently.

Markee with Pope-Hartford—Frederick D. Markee is the latest addition to the sales force of the Pope-Hartford Co., of Boston, Mass., where he will act as salesman for the Maxwell line just taken on by the company.

Keown Gets Promotion—J. S. Keown has just been advanced to the position of assistant manager of the Boston, Mass., Ford branch to take the place vacated by Forest H. Peabody, who was transferred to Louisville, Ky.

Hupp Joins Briggs-Detroiter—L. G. Hupp, of the former R-C-H Corp., has joined the forces of the Briggs-Detroiter Co. He has relinquished the Tribune M. C. Co.'s plant, which he started some time ago, to the Mercury Cycle Car Co.

Davis Opens Engineering Office—F. E. Davis, formerly an engineer for the Abbott Motor Co., Detroit, Mich., has formed an engineering company of his own in the same city. He is handling a number of specialties, as well, including the Kemco fan-generator.

Crockett a Benedict—J. B. Crockett has joined the benedicts. Recently he returned to this country from the Far East and remained here for a few months. He is now on his way to Singapore, where he will represent the Studebaker car, remaining there about two years.

Kennington to Cross Atlantic—W. O. Kennington, of the engineering department of the Remy Electric Co., Anderson, Ind., recently sailed for Europe in the interests of that company. He will be gone about eight weeks, and his trip will be spent in demonstrating the Remy electric system to automobile manufacturers.

Stanley Injured—F. E. Stanley, of Newton, Mass., inventor of the Stanley steam car, was injured recently in an accident on the Bradford bridge near Haverhill, Miss. In an endeavor to avoid another car, which made a sudden turn, Mr. Stanley drove his car directly into a telegraph pole at the side of the bridge road. Both he and his wife were taken to a nearby hospital.

Garage and Dealers' Field

Firestone's Montreal Branch—The Higgins & Lee Motor Tire Co. is representing the Firestone tire in Montreal, Que.

New Allentown Accessory House—The Allentown Auto Supply Co., Allentown, Pa., has been formed to deal in automobile accessories.

Republic in Larger Quarters—The Columbus, O., branch of the Republic Tire & Rubber Co. has moved into larger quarters at Fourth and Hay streets.

Bus Service at Tacoma—The board of trustees of the Tacoma Transit Co., Tacoma, Wash., met recently and elected officers. The service of this company will start January 15 between Tacoma, Sumner and Puyallup, Wash.

Motor Buses in Vancouver—A Vancouver, B. C., syndicate, backed by Frederick Briscombe, Joseph Martin and J. G. Woods, has made application for a franchise to operate motor buses on the streets and lanes of that city. The buses would be of the latest modern types, being similar to those in use in London and New York City.

Will Represent Weed Chain—The Motor Car Equipment Co., New York City, has been appointed sole distributer of the Weed chains for the metropolitan district, which comprises the following territory: New York City, all of Long Island and Brooklyn, Westchester County, Jersey City and Newark. This branch will be under the direct supervision of Gene Carbrey.

Milwaukee's First Cyclecar Agency—The first cyclecar agency in Milwaukee, Wis., has just been organized by A. C. Templeton, until now sales manager of the Milwaukee branch of the KisselKar, and G. W. Kliegel and R. J. Everhardt. The concern has taken the agency for the Imp cyclecar. The company is capitalized at $5,000.

Diamond and Goodrich Consolidate—There has been a consolidation of the Diamond and Goodrich tire sales branches in Indianapolis, Ind., and the consolidated business will be conducted in the quarters of the B. F. Goodrich Co. at Capitol avenue and Michigan street, with Henry A. Little as manager. O. C. Reavill, who was manager of the former sales branch of the Diamond Rubber Co. becomes a special representative of the manufacturer in Indiana.

Recent Incorporations in the Automobile Field

AUTOMOBILES AND PARTS

CHICAGO, ILL.—Mackey-Culehen Motor Co.; capital, $5,000; to deal in automobiles. Incorporators: N. W. Mackey, J. Maxculehen, F. DeYoung.

COLUMBUS, O.—Herreshoff Motor Co.; capital, $5,000; to deal in automobiles. Incorporators: O. M. Dickenson, J. F. Ward, W. C. Bennam.

EAU CLAIRE, WIS.—Northwestern Motor Co.; capital, $25,000; to manufacture gasoline motors for automobiles and tractors. Incorporators: Kim Rosholt, T. W. Rosholt, R. P. Rosholt.

GLOVERSVILLE, N. Y.—Gloversville M. C. Co.; capital, $15,000; to deal in automobiles. Incorporators: M. E. Everest, J. W. Sisson, L. B. Sisson.

HOUSTON, TEX.—Carr Motor Co.; capital, $10,000; to deal in automobiles. Incorporators: R. C. Carr, R. E. Goree, A. G. Ruggles.

LOUISVILLE, KY.—Louisville Motor Co.; capital, $5,000; to deal in automobiles. Incorporators: R. T. Durrett, W. P. Gray, C. M. Logan.

MEMPHIS, TENN.—Tri-State Auto Co.; capital, $15,000; to deal in automobiles. Incorporators: W. H. Court, R. E. Chew, Jr., J. H. Poston, Jr., and others.

MONTREAL, QUE.—Weldon Motor Co., Ltd.; capital, $10,000; to deal in automobiles.

NEWTON, N. C.—Newton Motor Co.; capital, $10,000; to deal in automobiles. Incorporators: R. Lee Hewitt, G. A. Warlick, R. W. Cline.

PHILADELPHIA, PA.—The Gibbons-Wetherill Service Co., to deal in automobiles. Incorporators: J. R. L. Gibbons, J. B. Wetherill, Jr., and A. H. Wetherill.

ROCHESTER, N. Y.—H. L. F. Trebert Rotary Motor Co.; capital, $150,000; to manufacture rotary motors. Incorporators: H. L. F. Tremert, L. Jerome Ogden, M. J. Schug.

TOLEDO, O.—Toledo Auto Cycle Co.; capital, $20,000; to deal in motor vehicles. Incorporators: A. L. Mayer, T. S. Powell, J. J. Kail, C. W. Neilson, Nat Smalley.

WALKERVILLE, ONT.—Fisher Motor Co., Ltd.; capital, $1,600,000; to deal in automobiles. Incorporators: C. F. Garaghty, F. E. Fisher.

WHEELING, W. VA.—Reo Motor Sales Co.; capital, $10,000; to deal in automobiles. Incorporators: T. H. Backman, W. A. Gullette, L. H. Bachman, C. F. Bachman, G. W. Yeago.

WHEELING, W. VA.—Tristate M. C. Co.; capital, $10,000; to deal in automobiles. Incorporators: L. F. Frobe, G. E. Griffith, Morris Jacobs, S. K. Johnson, T. Halpin.

WINNIPEG, MAN.—Rabbit Auto Sales Ltd.; capital, $10,000; to sell automobiles.

GARAGES AND ACCESSORIES

BROOKLYN, N. Y.—Bedford Auto Painting and Repairing Co.; capital, $1,000; to repair automobiles. Incorporators: John Sargh, Joe Kaufman, Abr. Rosenblatt.

BROOKLYN, N. Y.—Borough Park Taxi Co.; capital, $5,100; to do a general taxicab business. Incorporators: Stefano Chiarello, Diego Chiarello, Jos. Greenberg.

BUFFALO, N. Y.—Henderson Tire Co.; capital, $400,000; to manufacture automobile tires. Incorporators: C. O. Henderson, R. R. Hillman, A. L. Lyth.

DETROIT, MICH.—Tulite Auto Bulb Co.; capital, $25,000; to manufacture automobile lamps and electrical fixtures. Incorporators: L. J. Lepper, J. M. Richardson, W. F. Adams.

MAYFIELD, KY.—Sav-Air Co.; to manufacture preparations to prevent puncture of automobile tires. Incorporators: J. T. Lockridge, W. F. Smity, J. W. Christy.

NEW YORK CITY—Golde-Patent Mfg. Co.; capital, $200,000; to manufacture automobile accessories and tops. Incorporators: E. A. Golde, R. E. Golde, Alfred Langer.

NEW YORK CITY—Convertible Automobile Body Corp.; capital, $250,000; to build automobile bodies. Incorporators: Ladis Lewkowitz, E. I. Gottlieb, Mary Kaplan.

NEW YORK CITY—J. D. Cogan Co.; capital, $1,000; to deal in automobile bodies. Incorporators: F. H. Twyeffort, C. E. Healy, E. J. Ellenwood.

NEW YORK CITY—Motor Cooling Co.; capital, $10,000; to manufacture compounds for cleaning automobile radiators. Incorporators: C. R. Allison, J. F. Clarke, W. J. F. Lammar.

NEW YORK CITY—Pennsylvania Taxi Co.; capital, $14,000; general taxicab business. Incorporators: Pancrazio Grassi, Pasquale Goviello, J. E. Mona.

NEW YORK CITY—Puncture-Proof Double Tire Co.; capital, $500. Incorporators: M. D. Ancel, Nathan Cranston, Joseph Siskind.

NORFOLK, VA.—Auto Supplies Co.; capital, $15,000; to deal in accessories. Incorporators: M. A. Brandt, H. M. Brandt.

OSHKOSH, WIS.—Winnebago County Auto Co.; capital, $18,000; general garage business. Incorporators: G. E. Steiner, F. C. and M. Behlendorf.

SCHENECTADY, N. Y.—MacDonald Garage Co.; capital, $10,000; general garage business. Incorporators: L. Robert MacDonald, Pliny Spaulding, A. D. Atwood.

ST. LOUIS, MO.—Pneumatic Devices Co.; capital, $50,000; to manufacture door opening and closing device. Incorporators: Nelson S. Goltshall, Henry B. Graham, John F. Bishop.

CHANGES OF NAME AND CAPITAL

ALLIANCE, O.—Alliance Rubber Co.; capital increased from $100,000 to $150,000.

New Agencies Established During the Week

PASSENGER VEHICLES

Place	Car	Agent
Aberdeen, Miss.	Oakland	Lamn-Carter Hardware Co.
Arbuckle, Cal.	Chalmers	The Pioneer Co.
Astoria, Ore.	Cole	J. A. Gilbaugh.
Biloxi, Miss.	Oakland	J. A. Pendola.
Boston, Mass.	Westcott	J. W. Harding.
Bridgeton, N. J.	Cole	G. C. Westcott.
Bristol, Conn.	Oakland	S. J. Cushner.
Buffalo, N. Y.	Abbot-Detroit	Hurd-Lansheft Motor Co.
Campello, Mass.	Cole	Cole Motor Sales Co.
Charlotte, Mich.	Oakland	Donovan & Son.
Chico, Cal.	Chalmers	The Pioneer Co.
Colton, Wash.	Maxwell	Hornburg Automobile Co.
Croswell, Mich.	Oakland	Avery Martin.
Davis, Cal.	Chalmers	The Pioneer Co.
De Kalb, Ill.	Oakland	J. F. Quinn.
Denver, Colo.	Moon	Vreeland Bros.
Dilly, Tex.	Oakland	W. L. Crawford.
Dry Ridge, Ky.	Oakland	Dan Points.
Duluth, Minn.	Franklin	Interstate Auto Co.
Emporia, Kan.	Cole	J. E. Martin.
Fall River, Mass.	Oakland	Mt. Hope Auto & Supp. Co.
Fargo, N. D.	Franklin	Fargo Auto & Supply Co.
Fort Worth, Tex.	Locomobile	Elsing Motor Car Co.
Gallipolis, O.	Oakland	Stewart & Maddy.
George, Ia.	Oakland	Jacob Bruns Garage.
Gulfport, Miss.	Oakland	Gulfport Auto Co.
Hancock, N. Y.	Cole	T. F. Stimpson.
Hot Springs, Ark.	Oakland	Shelton & Crawford.
Johnson, Wash.	Maxwell	Hornburg Auto Co.
Kansas City, Mo.	Empire	Western Motor Co.
Kansas City, Mo.	King	Interstate Auto & Supply Co.
Kansas City, Mo.	Pathfinder	Western Motor Co.
Kerhonkson, N. Y.	Oakland	Marshall-Hanson Co.
Kunkletown, Pa.	Oakland	A. O. Greenzweig.
Little Falls, N. Y.	Cole	N. B. Brenner.
Lockhart, Tex.	Moon	E. H. Lipscomb.
Los Angeles, Cal.	Marathon	L. E. Crowe & E. L. Simonds.
Los Angeles, Cal.	Marion	L. E. Crowe & E. L. Simonds.
Louisville, Ky.	Lozier	Louisville Motor Co.
Lyons, France	Pullman	Mons. A. Merthan.
Marvel, Ark.	Oakland	F. R. Garner, Jr.
Marysville, Cal.	Chalmers	The Pioneer Co.
Mathis, Tex.	Moon	C. C. Braden & Co.
McKeesport, Pa.	Moon	J. T. Mooney & Son.
Miami, Fla.	Franklin	C. L. Craig.
Minneapolis, Minn.	King	Martin Sales Co.
Minneapolis, Minn.	White	Merritt J. Osborn.
Monessen, Pa.	Moon	Monessen Plumbing & Electric Co.
Nashville, Tenn.	Moon	J. H. Lawrence & Sons.
Odell, Ill.	Moon	Cosgrove & Cleary.
Oneonta, N. Y.	Cole	J. A. Dewar.
Oroville, Cal.	Chalmers	The Pioneer Co.
Oskaloosa, Kan.	Overland	S. McCright.
Ottawa, Kan.	Overland	John Nelson & Co.
Parsons, Kan.	Overland	Chapman Sales Co.
Passaic, N. J.	Cole	Duncan Auto Co.
Pine Bluff, Ark.	Overland	F. G. Smart.
Princeton, Kan.	Overland	Blouch & Tawney.
Reading, Mich.	Oakland	Ray A. Tyrrill.
Rhinelander, Wis.	Moon	Oneida Garage & Machinery Co.
Rockford, Ill.	Franklin	L. J. Theiss.
Rome, N. Y.	Oakland	R. C. Lagai.
Roseburg, Ore.	Cole	Joe Blosser.
Sanborn, N. D.	Ford	A. A. Canfield Co.
San Francisco, Cal.	Velie	Reliance Automobile Co.
Seattle, Wash.	Pullman	F. L. Parker & C. L. Parker.
Seattle, Wash.	Stearns	Seattle Auto Co.
Stanford, N. Y.	Cole	Robert Hume.
Starkville, Miss.	Oakland	Scales & Carpenter.
Steele, Idaho	Overland	M. I. Steele.
Sumner, Miss.	Oakland	H. B. Flaut.
Texarkana, Tex.	Oakland	The Auto Co.
Toronto, Can.	Pullman	W. H. Pearson.
Union City, Mich.	Oakland	J. W. Martin.
Van de Grift, Pa.	Moon	Whitacre & McCullough.
Wheeling, W. Va.	Lozier	Union Auto Co.
Wichita Falls, Tex.	Oakland	Schnell & Weaver.
Wilmington, O.	Regal	W. H. Hoskins.
Winchester, Ky.	Oakland	Asa Hughes.
Windsor, Vt.	Oakland	F. L. Cabot.
Wooster, O.	Oakland	E. C. Benner & Co.
Youngstown, O.	Cole	Dittrich Motor Car Co.

COMMERCIAL VEHICLES

Los Angeles, Cal.	Stewart	The Chalmers Los Angeles Co.
Menno, S. Dak.	Oakland	G. A. Haisch.
Milwaukee, Wis.	Four Wheel Drive	A. O. Hughes Motor Co.
Minneapolis, Minn.	Palmer-Moore	Motor Truck Sales Co.
Philadelphia, Pa.	Kelly Springfield	Bartlett Garage, Inc.
Seattle, Wash.	Four Wheel Drive	E. J. Kennedy.
York, Pa.	Autocar	T. S. Pfeiffer.

Accessories for the Automobilist

BOSCH Loop Terminal—This terminal is chiefly noteworthy because of its simplicity and ability to establish a permanent and perfect electrical contact without the use of solder. It is made in two models, one for heavy insulation such as is used in high-tension work and the other for light, as illustrated in Figs. 1 and 2, respectively. For heavy insulation the terminal consists of a brass tube 1.375 inches in length, with one end beveled to form a sharp edge to fit snugly over the stranded wire and the other end closed. After this tube is attached it is formed into a loop by the tool shown in Fig. 3. Before attaching it is necessary to strip the insulation from the cable for about .875 inch and the terminal tube is then slipped over the conductor with the beveled edge first and is forced under the insulation until the end of the conductor is flush with the outer end of the terminal tube. An idea of the interior of the cable after the tube is put on is given in Fig. 1. While in the process of bending, the tube is somewhat flattened, thereby gripping the conductor or wire strands with sufficient tightness to prevent its becoming loose under any condition. For low-tension work the cable diameter is so small that it would be impossible to force the terminal under the insulation, and therefore the tube is expanded at one end, as shown in Fig. 2, thus providing a ferrule which slips over the insulation. Although these terminals can be applied by using a round-nosed pliers the Bosch company advises the use of a special tool mentioned. The handle of the tool, as shown in Fig. 4, is hollow and contains the other handle, which is an extension of the knurled nut A, and the pin B around which the terminal is bent. The tool is shown assembled in Figs. 5 and 6. In attaching one of these terminals the cable end is placed in the groove C, Fig. 4, with the end of the cable flush with the front end of the groove. A mark is then made on the insulation at the rear end of the groove to indicate the amount to be removed. This is done by inserting the end of the conductor, Fig. 5, under the knife, winding it around the handle and forcing it off by pulling the handles apart. The terminal tube is then carefully slipped over the conductor until it comes up against the insulation, care being taken to include all the strands. The cable is then laid in the measuring groove C and is forced forward until the end of the insulation comes against the stop D, when the pin B is inserted into the center hole and worked or forced into a vertical position, as shown in Fig. 6. The loop is now formed by pulling the handles together, this operation bending the end of the terminal around the pin B. The finished terminal is shown in Figs. 1 and 2. The terminal tool is made for the trade principally and lists for $15.

Standard Tire Protector—A re-tread while you wait is what the Goodyear company calls its new tire protector, which is an extra casing that fits over the ordinary tire and is held in place simply by the inflation of the tire. It is easily slipped over the shoe when the latter is deflated. This tread can be applied to a new shoe, thus saving the shoe and almost completely doing away with the possibility of punctures or blowouts, because it is the protector that comes in contact with the sharp stones and nails and other things that injure tires, while the casing is used merely to withstand the pressure of the air. Another application of this tread is to a shoe that is about worn out. In many cases it is claimed that this results in a saving, because if the shoe should blow out after a few miles' running, the tread can be removed and placed on another old shoe, but when the retread is an integral part of the casing it is lost whenever a blowout occurs.

Compound Mixer—A simple device which is located on the dash and performs the double function of supplying the motor with the right mixture and priming it for starting is made by the National Mfg. Co., Kalamazoo, Mich. The primer consists of two cylinders connected by a pipe with a plug cock, and a pipe running to the intake manifold from the bottom of the right hand cylinder. The right cylinder is the mixer, and it is claimed that carburetion is improved by its operation, because it is designed to supply the extra air required for economical running. The left cylinder is the primer and is ordinarily filled with gasoline, which is supplied to the intake pipe for starting by opening the cock between the cylinders. This primer may also be used for cleaning carbon out of the cylinder. Put two ounces of alcohol or kerosene in the priming tank, run the motor with spark retarded until it becomes quite warm and open the primer until the motor slows down. Then close it until it picks up again, and repeat this operation until the tank is empty. It is claimed that this will loosen up the carbon, which will blow out of the exhaust pipe. The price of this primer is $12.

Tire-Lac—Specially prepared rubber paint for brightening tires and rubber matting is compounded by the Northwestern Chemical Co., Marietta, O. It not only improves the appearance but also is claimed to protect rubber from the deteriorating effects of sunlight, water and oil. Tire-Lac is made in two colors designated as rubber white and rubber gray, and is sold for 60 cents a can.

Roffy Headlight—A decidedly novel headlight, novel in its construction, appearance and method of installing, is marketed by the Roffy-Grace Corp., 1926 Broadway, New York City. Fig. 1 shows the principal features of this light, which is designed to evenly illuminate the roadway and at the same time do away with the glare which is so objectionable in the present type of headlights. This is ac-

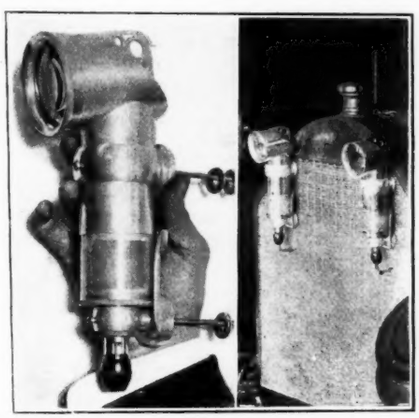
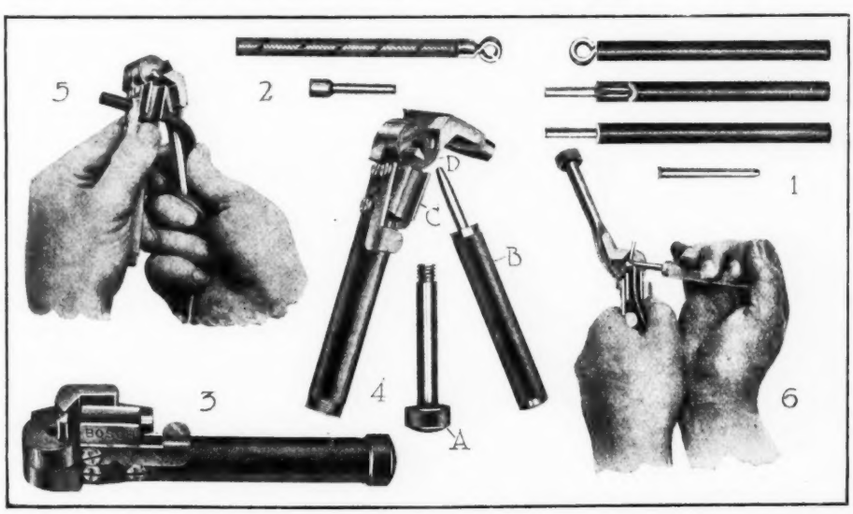


Fig. 7—Roffy headlight. Method of installation is shown on the left



Bosch loop terminals and tool: Fig. 1—High-tension terminals. Fig. 2—Low-tension terminals. Fig. 3—Tool as it looks when not in use. Fig. 4—Disassembled view, showing pin B, around which loop is formed, and handle A. Fig. 5—Method of stripping insulation off. Fig. 6—How pin is inserted

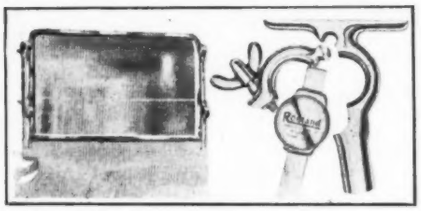


Fig. 8—Rostand windshield: Left, showing installation on car; right, detail of hinge. Note invisible glass edges

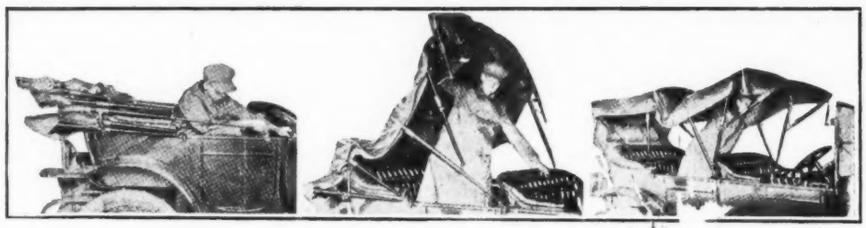


Fig. 9—Single man top sockets: Left, pulling forward telescopic rods; center, how rods assist in raising top; right, showing top about up, the rods having telescoped into the bows

complished by a train of condensing and projecting lenses separated by a mirror and used in connection with a specially designed tungsten bulb of mushroom shape. The light beam from the lamp has sharply defined edges, and since the upper rays never rise above the horizontal there can be no glare in the faces of the people on the roadway. As seen in the illustration the installation of these lamps is very simple, as they are held by bolts which pass through the radiator.

Rostand Windshield—An interesting windshield design by the Rostand Mfg. Co., Milford, Conn., is shown in Fig. 8. It is built into the car and is a development of the now common practice of fitting windshields as standard equipment. One feature of its construction is the almost invisible glass joint between the two halves; no binding is used on these adjacent edges and therefore vision is almost as perfect as if the glass were made in one piece. Both halves are pivoted to the side members which are fastened into the cowl and hinges permit the windshield to be adjusted for any position desired. For driving in rainy weather the upper half may be raised to an angle of about 45 degrees, thus giving a clear view of the road and at the same time protecting the driver from the weather. When ventilation is wanted, the lower half may be turned at an angle, thus deflecting the air down into the foot space. One of the hinges on which the halves are pivoted is shown in Fig. 8, and is interesting because its construction permits of the removal of the windshield by simply unscrewing a butterfly nut. By tightening up this nut the windshield members are held firmly in place.

Single Man Top Sockets—The desirability of having a top that can be raised or lowered by one man is unquestioned, and it is easy enough to get a new top of this type, but now the Dayton Top Improvement Co., Dayton, O., comes forth with an attachment which makes it possible for one man to put up any of the old style tops easily. This is accomplished by replacing the forward main bow by one with telescopic rods which are pulled out and fastened to the bow sockets at the sides of the front seats. The top is then raised by grasping it under the forward bows, as shown in Fig. 9, the rods sliding back into the recesses in the bows as the top is extended, so that when the top is fully up they are out of sight.

Auto Life-Saving Fender—The Auto Life Saving Fender Co., 672 Pacific street, Brooklyn, N. Y., is about to place on the market an inconspicuous and automatic fender, Fig. 10, that is operated when the machine is traveling at a rate of speed of three miles an hour or over. Any one coming in contact with either the upper or lower rail, both of which are arranged to yield under slight pressure, causes the bottom of the fender, which is flexible in character, to shoot forward along the ground. The front edge of the fender is provided with a reversible shoe, Fig. —, or obstacle rider which automatically rides over any projecting stone or car track, thus preventing the fender from breaking or the driver from receiving any jar. The action of this fender is so instantaneous that if one grasps the upper rail he is rescued in a standing position, as shown in Fig. 11.

Midget G Ammeters—A new type of ammeter and voltmeter especially designed for the automobile trade and used in connection with starting and lighting systems comes from the factory of the Eldredge Mfg. Co., Springfield, Mass. These meters, which are designated as the Midget G, are generally made with the zero at the center so that both charge and discharge can be shown. They are very small, the front diameter being 23 inches and they project only about .25 inch from the surface of the cowl. The regular ranges of the ammeter are 10, 15 and 20 amperes, with zero center, reading charge and discharge, while voltmeter ranges of 10 and 15 volts may be had. These instruments retail at $3.75.

Mansfield No-Skid Tire—The Mansfield Tire & Rubber Co., Mansfield, O., has brought out a new non-skid tire for which many original features are claimed. The tread, which consists of longitudinal and circumferential bars of rubber, is thickest where the greatest wear occurs, and the construction of the non-skid feature is such that one part holds another. Between the bars are depressions in which a vacuum is formed when traveling on smooth streets, while the projections give tractions on wet and sandy roads.

Universal Wire Wheel—The increasing popularity of the wire wheel has led the Lindsay Auto Parts Co., Meridian Life Building, Indianapolis, Ind., to design a wheel for Ford automobiles. It is constructed so that it replaces the ordinary wooden wheel without any fitting whatever. Front and rear wheels are similar, excepting for the brake drums, which, of course, are found only on the rear. The small size, 30 by 3 on the front and 30 by 3.5 inches in the rear, also makes this wheel suitable for cycle car use. The price is $56 per set of four.

Sparton-Echo—A new member of the Sparton family is illustrated in Fig. 12. It is a hand operated signal with the feature that no gears are used in its construction, and therefore it is claimed that nothing can get out of order. The horn can be so located that it can be operated by the hand, elbow, knee or foot. By means of an ordinary screw driver the tone can be adjusted to suit without taking the instrument apart. The maker is the Sparks-Withington Co., Jackson, Mich.

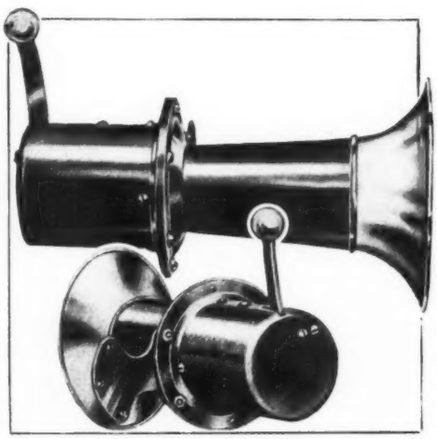


Fig. 12—Two views of Sparton Echo horn, lower view shows bracket for mounting

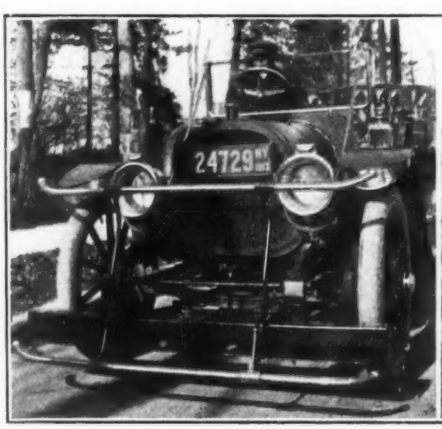


Fig. 10—Auto life saving fender, showing double bumpers

Fig. 11—Fender, showing method of rescuing victim